BELL TELEPHONE QUARTERLY

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AUTOMOTIVE EQUIPMENT AND CONSTRUCTION APPARATUS IN TELEPHONE COMPANY SERVICE

IMPORTANT LONG RADIOTELEPHONE CIRCUITS OF THE WORLD

NOTES ON RECENT OCCURRENCES

AMERICAN TELEPHONE & TELEGRAPH CO. • NEW YORK

BELL TELEPHONE QUARTERLY

A Medium of Suggestion and a Record of Progress

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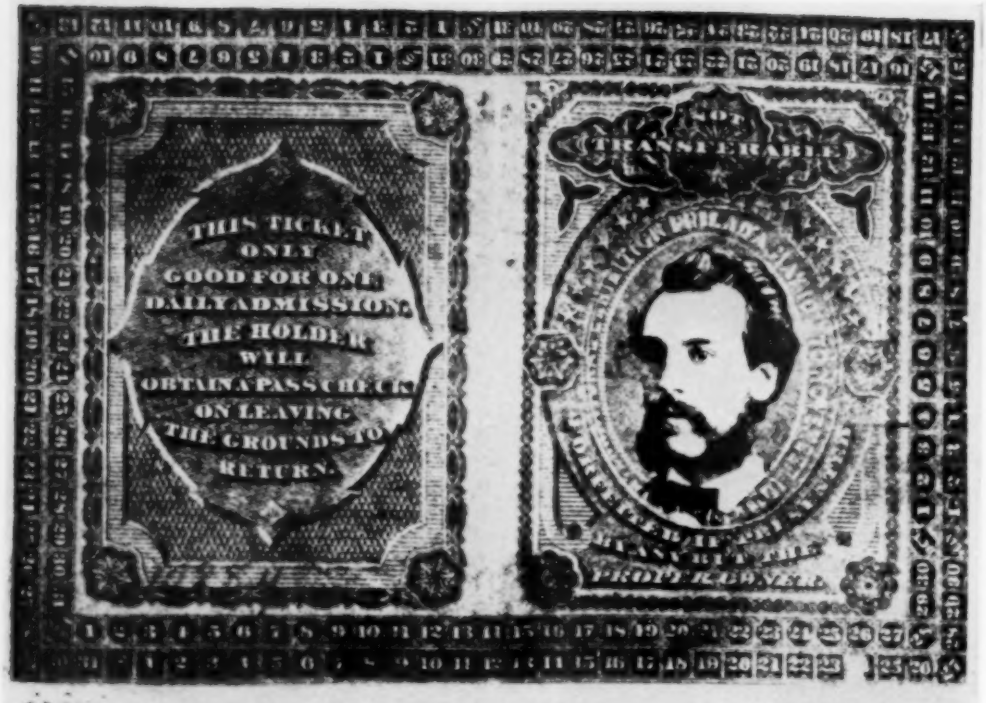


Alexander Graham Bell's Pass as an Exhibitor at the Centennial Exposition in Philadelphia, 1876

Some Historic Telephone Exhibits

THERE are few things in the home and business life of the America of today more familiar than the telephone; few experiences that come closer to the commonplace than that of making a telephone call. Why, then, do thousands of visitors crowd the Bell System exhibits at the New York World's Fair and the Golden Gate International Exposition, at San Francisco, and why is it that, of all the many things to be seen and heard at these exhibits, the principal center of interest is invariably the demonstration of long distance telephone service, in which the guests either participate in a telephone conversation or "listen in" while others do so?

Probably the explanation lies in the very nature of the service which the telephone provides. Of all products of man's ingenuity and enterprise which find a place at a modern exposition, this is the one which, as daily used, enters most intimately into the personal life of its user. In a unique and particular sense, it supplements his own personality. It is peculiarly a part of his own self. Not alone in the "Voice Mirror" does the visitor at an exposition telephone exhibit "hear his own telephone voice." As he listens in on a long distance conversation he figuratively "sees himself as others see him." Whether actually in person or by the vicarious process of hearing the voices of others, he is made to feel that here is a demonstration which is unlike most of the other exhibits at the typical exposition in that it is one in which he, himself, can participate.

For sixty-three years—ever since the astounded Dom Pedro heard the voice of Bell coming over the wire to his ear, at the great Philadelphia Centennial in 1876, and exclaimed "My God, it talks!"—this intimate and personal nature of telephone service has been the quality that has attracted exposition

crowds to the exhibits at which the telephone and the telephone service have been featured. From the day of the demonstration before the Brazilian emperor to today, the opportunity personally to participate in tests of the telephone and of telephone facilities has appealed strongly to the public. In competition with far more elaborate and spectacular exhibits, the telephone has always proved a drawing card, because exposition crowds could not only see it in use, but use it.

A review of the more important expositions at which the telephone has played a part may prove of interest, not alone from the standpoint of showing the development of the arrangement and operation of the telephone exhibits, but from the aspect of telephone development itself.

The Philadelphia Centennial

The importance of the incident in which Dom Pedro played so vital a part is not generally understood. Its drama and the prominence of the principal figures involved are often stressed at the expense of the practical results which grew out of this colorful incident. What happened on that historic Sunday afternoon, June 25, 1876, had a direct and vital bearing on the whole course of the commercial development of the telephone in the United States, if not throughout the entire world.

Bell had obtained his telephone patent on March 7 of that year, it will be remembered, and three days later had succeeded in transmitting the first complete sentence of speech. But apart from one lecture, before a scientific society in Boston, he had made no effort to bring his invention to the attention of the public. At the instigation of Gardiner G. Hubbard, one of his two financial backers and business advisors, he had decided to exhibit his telephone and harmonic telegraph apparatus at the Philadelphia Centennial. By the time this de-

cision had been made, however, space in the electrical section, where such apparatus would naturally have been displayed, was no longer available. Hubbard managed to obtain space in the educational section of the Massachusetts state exhibit, in a gallery of the Main Building. Even after he had obtained this concession, Hubbard had difficulty in persuading Bell to prepare his apparatus and send it to Philadelphia. Bell was busy with his classes as a teacher of the deaf, and was reluctant to leave them for the purpose of going to Philadelphia in person. Finally, however, Hubbard learned that the Centennial judges of the group of exhibits in which Bell's apparatus was included were to make an official inspection on Sunday, June 25, 1876. With great difficulty, and aided and abetted by his daughter, Mabel Hubbard, who was later to become Bell's wife, Hubbard finally convinced the young inventor that he should take his apparatus and set out for the exposition city. He arrived there on Saturday, June 24.

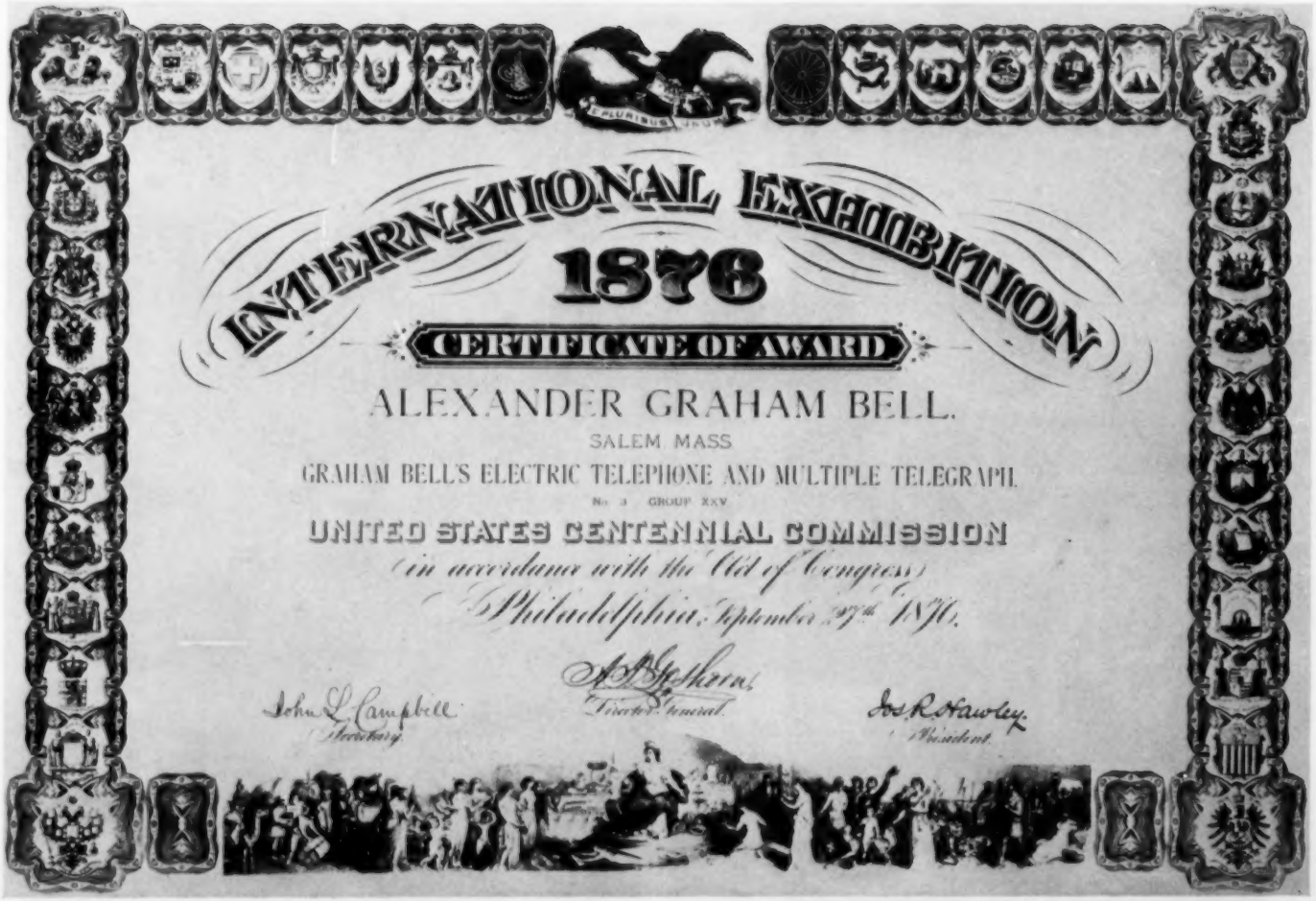
Incidentally, it is of interest to note that this date was the only day on which the pass, issued to Bell as an exhibitor, shows evidence of having been used. The inventor seems to have set up his apparatus on that day and returned on the following day to await the arrival of the judges. The exposition buildings were not officially open to the public on Sundays, and apparently he did not find it necessary to present his pass, or at any rate to have it punched. Bell was personally present at the exposition only on these two days—a fact which has an important bearing on the reliability of the recollections of various people who now "recall" that they saw him at the exposition, and witnessed his demonstrations of the telephone, sometimes even describing the incident in which Dom Pedro took part. In view of the fact that the buildings were not open to the general public on the day when the meeting between the emperor and the inventor took place, it seems extremely unlikely that there were many witnesses to it, other

than the Centennial judges and the members of Dom Pedro's official party.

The story of the historic meeting is too familiar to require detailed repetition here: of how the judges, fatigued with their inspection on a hot, humid day, were on the point of discontinuing their tour when the emperor noticed Bell, whom he had previously interviewed in Boston in regard to the latter's work with the deaf; of his interest when Bell explained the reason for his presence at the Centennial and his request for a demonstration of the telephone; of his startled ejaculation when he heard the inventor's voice coming from the receiver.

Up to this point, the story is hardly more than a bit of colorful drama, but now telephone history begins. The judges crowd around, and themselves try the telephone. Among them is Sir William Thomson, the great English physicist, later to say of Bell's invention that it was "the most wonderful thing he had seen in America." Another is Joseph Henry, Secretary of the Smithsonian Institution, who declares the telephone to be "the greatest marvel hitherto achieved by the telegraph."

Accounts of Bell's demonstrations at the Centennial, and of the independent tests of the telephone by the judges, which followed, soon appeared in leading scientific magazines and attracted widespread attention. From all over the country inquiries began to arrive as to how licenses, under the Bell patents, might be obtained to develop the telephone commercially. Such licenses were issued to individuals or groups of individuals to provide telephone service—which at first involved no exchanges, but consisted merely of the leasing of pairs of telephones—in specific localities or territories. Given impetus, in other words, by the publication of what had occurred at the exposition in Philadelphia, the telephone moved out of the laboratory into the business office. The commercial development of Bell's invention began. The foundations of the organization which is largely responsible for the provision of nation-wide telephone service in America today were laid



CERTIFICATE OF AWARD GRANTED TO ALEXANDER GRAHAM BELL FOR HIS TELEPHONE AND MULTIPLE TELEGRAPH EXHIBITS AT THE PHILADELPHIA CENTENNIAL EXPOSITION, 1876

BRONZE MEDAL AWARDED TO ALEXANDER GRAHAM BELL AT INTERNATIONAL EXPOSITION, CELEBRATING A CENTURY OF AMERICAN INDEPENDENCE, PHILADELPHIA, 1876

MEDAL OF PROGRESS AWARDED TO THE TELEPHONE COMPANY OF NEW YORK AT AMERICAN INSTITUTE FAIR, IN NEW YORK, 1877. This was the first medal ever awarded to a Telephone Company.

in the swift-moving events which followed that dramatic incident on a hot June Sunday in 1876. The licensees of sixty-three years ago were the forerunners of the present Associated Companies of the Bell System.

American Institute Fair, 1877

Two of the licensees under the Bell patents were Charles A. Cheever and Hilborne L. Roosevelt. They were assigned a territory consisting of New York City and certain surrounding areas, and organized The Telephone Company of New York. To this company fell the honor of being the first to exhibit the telephone, for purposes of its commercial promotion, at a fair or exposition. To it was awarded the first medal ever granted to a telephone company for such an exhibition.

Under the leadership of such prominent New Yorkers as Horace Greeley, the American Institute of the City of New York had for many years held an annual fair which, although not of the proportions of an international exposition, always included an extensive display of industrial and scientific exhibits and attracted great crowds. In the fair of 1877, Cheever and Roosevelt saw an opportunity of bringing the telephone directly to the attention of the New York public.

Excellent showmen that they were, they saw, as their successors have seen ever since, that the most convincing proof of the usefulness of the telephone lay in affording an opportunity for visitors at the fair themselves to try it—the old test of "the proof of the pudding is in the eating."

A guest register kept at the telephone exhibit contains the names of many prominent figures of the day, such as J. P. Morgan, Wendell Phillips, Samuel F. B. Morse and William Cullen Bryant. And among names then not widely known, was one that later was to loom large in the annals of the telephone—that of Theodore N. Vail. Some of the comments of the guests, giving their impressions of the telephone, afford

convincing proof that Bell's invention was one of the outstanding features of the fair. This volume is now preserved in the American Telephone Historical Library, in New York.

Among the awards by the official judges at the fair was a "Medal of Progress"—granted to The Telephone Company of New York. It was for many years in the possession of Mr. Cheever's family, but recent efforts to locate it have proved unavailing.

Paris Exposition, 1889

The first international exposition at which the Bell System —though it was not known as such at the time—had an exhibit was the Exposition Universelle, at Paris, in 1889. Photographs of the exhibit show that it was made up of items provided by the American Bell Telephone Company and the Western Electric Manufacturing Company.

Emphasis was placed on the development of long distance service, in which, as at all times since the invention of the telephone, the United States then held a commanding position. The American Telephone and Telegraph Company had been organized only four years before, for the purpose of developing a network of long lines connecting the territories of the various licensees. It is worthy of note that the central item of the American Bell display was the top of one of the standard long distance open wire poles—a type of construction then little known in Europe, and one of which the Bell engineers were justly proud.

Although the United States led the world in long distance development, both as to the extent of facilities and efficiency of service, the long distance circuits of the Bell System in 1889 extended only as far west as Buffalo and as far south as Washington. These were the outposts beyond which the human voice had not yet been transmitted.

Much had been accomplished, but much more remained to be achieved. The exhibit at Paris marked a milestone in tele-

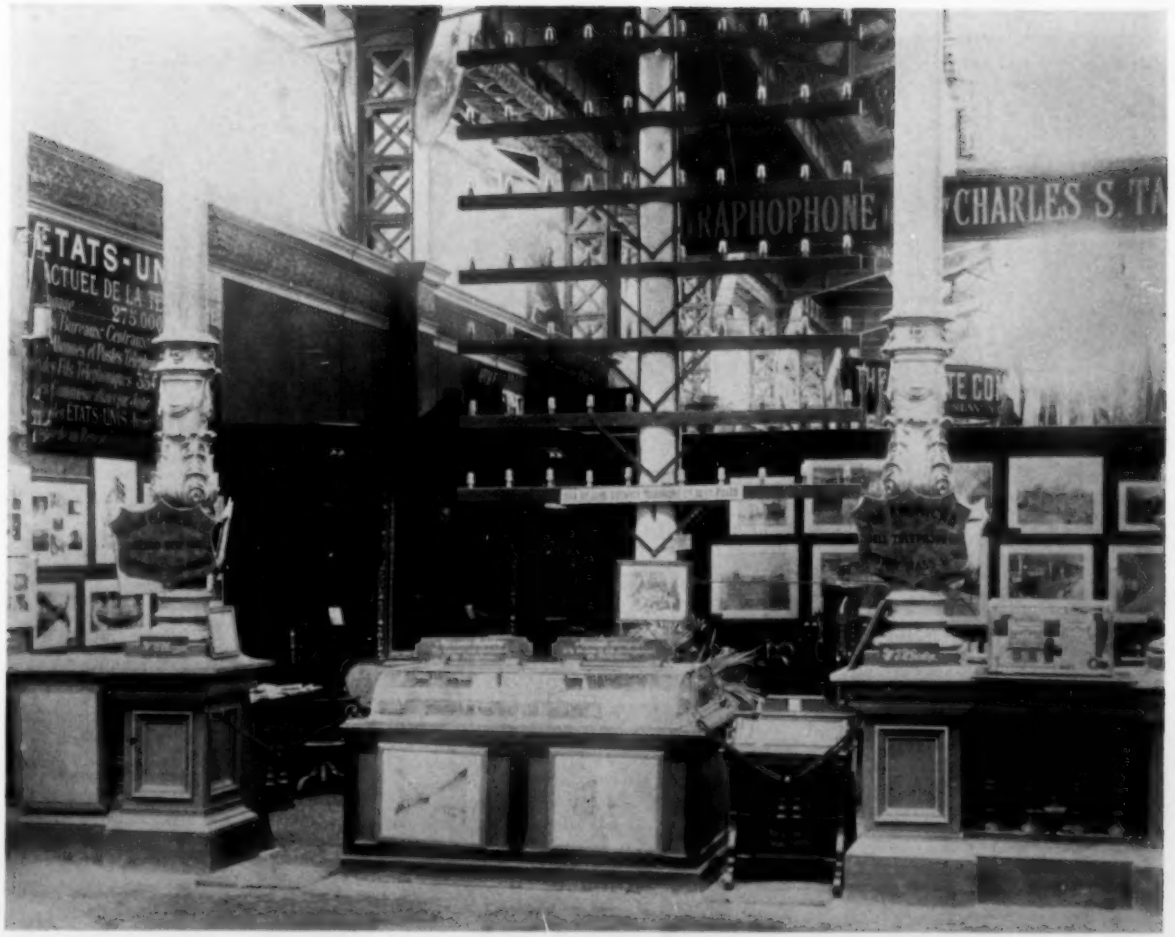
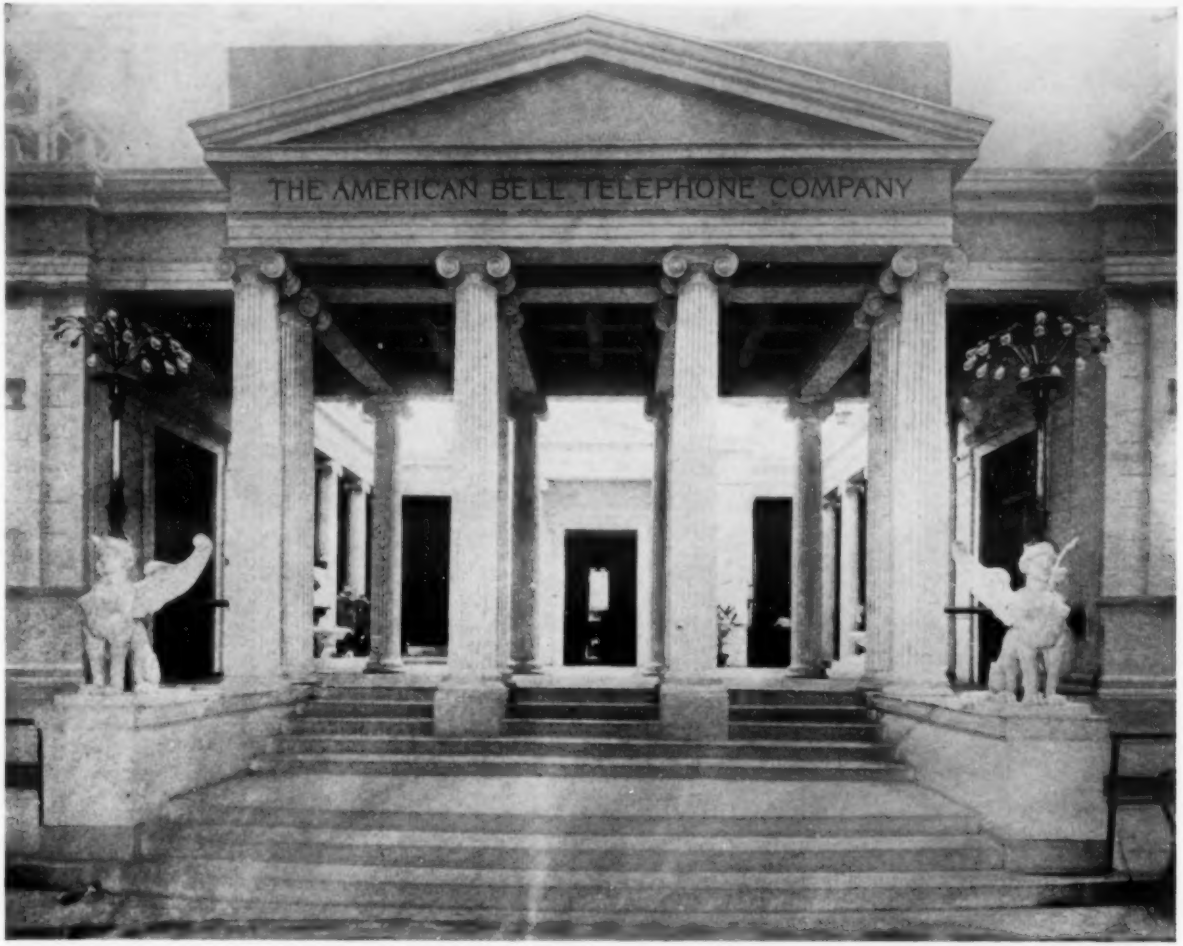


EXHIBIT OF AMERICAN BELL TELEPHONE COMPANY AND WESTERN ELECTRIC MANUFACTURING COMPANY AT THE EXPOSITION UNIVERSELLE, PARIS, IN 1889



THE EXHIBIT OF THE AMERICAN BELL TELEPHONE COMPANY AT THE COLUMBIAN EXPOSITION IN CHICAGO IN 1893 WAS HOUSED IN A BUILDING OF CLASSIC DESIGN, COPIED FROM A GREEK TEMPLE

phone history, for it attested what had been attained in a little more than a decade of telephone development. It afforded little indication of what, in the hopes and dreams of telephone engineers, was yet attainable. The relatively modest Bell System display must have aroused but meager interest, as contrasted with the Eiffel Tower, which was erected as the chief attraction of the Paris exposition. Yet there is something that appeals to the romantic in the fact that it was on an antenna on the Eiffel Tower that, twenty-six years later, two Bell System engineers picked up the first words ever transmitted across the Atlantic by radio telephone, and thereby blazed the trail which led to the world-wide telephone service of today.

Telephone engineers in 1889 were not even thinking of immediate goals as ambitious as a service which reached across the oceans or even across the continent—their next objective was much less visionary, though difficult enough to seem, to the layman, to be impossible. They were dreaming of a thousand-mile telephone line.

The Columbian Exposition, 1893

The American Bell Telephone Company's exhibit at the great Columbian Exposition, in Chicago, in 1893, was to afford proof that it sometimes pays to dream. By then, the thousand-mile telephone talk was an accomplished fact. New York and Chicago were within voice-reach of each other. A new chapter had been written in the history of communication in America.

And, to celebrate this event, the Bell System had an exhibit that was one of the centers of attraction for World's Fair visitors. Within the Electrical Building the American Bell Telephone Company built its own building. Classic in design, it set a standard for dignity and beauty that has been adhered to in Bell System exposition exhibits ever since. Tastes in art have changed in the four and a half decades since this

replica of a Greek temple was designed, but the fundamental purpose of creating something truly expressive of the character of the Bell System has not been forgotten in designing such exposition buildings as that which houses the American Telephone and Telegraph Company exhibits at the New York World's Fair of 1939.

Here in the Columbian Exposition exhibit were displayed replicas or originals of historic pieces of telephone apparatus; charts and maps showing telephone development; some of the newest advances in Bell System equipment, including specimens of dry-core, paper-insulated cable, which had been but recently introduced.

In keeping with what later became an established policy of giving the public an opportunity to see what lies behind telephone service, the switchboard which served all exposition telephones was installed in the exhibit building, in full view of the crowds of visitors, so that they could watch it in operation. Attendants were on hand to give any desired information in regard to the equipment, and at regular intervals "a plain and concise description of the board and its method of operation" (to quote a booklet describing the telephone exhibit) was given.

The same booklet makes it clear that the newly-opened New York-Chicago long distance telephone line was the real attraction of the World's Fair, so far as the telephone exhibit was concerned. After pointing out that the thousand-mile telephone conversation was now an every-day occurrence, this brochure thus describes the 1893 version of the long distance demonstrations that are proving so popular today at New York and San Francisco:

> To test the ease with which one talks this distance, an opportunity is given for visitors to speak with an operator in one of the offices of the American Telephone and Telegraph Co., in New York, every afternoon between three and five.

One of the interesting features of the exhibit was Alexander Graham Bell's radiophone (also known as the photophone).

This transmitted speech from a station in one of the galleries to another in the opposite gallery, one hundred feet away, by means of a beam of light. The name seems to have been prophetic, for it suggests that which was later applied to the apparatus by which the wireless transmission of speech was accomplished by electro-magnetic waves of much greater length than those used by Bell in talking over a light beam. The latter were, however, electro-magnetic waves, and Bell's apparatus was, in a sense, the forerunner of the far-flung radio telephone systems of the present day.

But the exposition crowds, like those of today, were chiefly interested in those features of the exhibit which showed the development of the telephone itself, and of supplemental apparatus which enabled it more and more fully to serve the needs of the public. The switchboard and the long distance booth were distinctly the most popular of all the remarkable things the Bell System had on view, for they most clearly demonstrated the actual application of research and experimentation to the practical needs of everyday life.

A Period of Telephone Expansion

If the Bell System's exhibit at the Columbian Exposition marked the end of one phase of telephone development—and the demonstration of the thousand-mile telephone line did mark such an epoch—it marked also the virtual beginning of another and not less important phase. This was a period of rapid expansion and growth, particularly of long distance service.

It is interesting to note also that several of the more important expositions held during the next decade and a half afford a clear sidelight on progress in the industry outside the Bell System. At the Louisiana Purchase Exposition, held in St. Louis in 1904, for example, several of the independent telephone companies and telephone manufacturing companies had extensive exhibits. The Bell System's exhibit was not as large, or as

impressive, as had been that at the Chicago exposition, but what it had was directed to the objective of acquainting the public with the extent and efficiency of the service, and of showing this service in actual operation.

The Bell System was laying new stress on the importance of keeping the public informed as to the nature of telephone service, the equipment required to provide it, and the personnel behind it. It is noteworthy that at St. Louis, for the first time at any exposition, booklets covering a wide variety of subjects having to do with telephone service were made available for the visitors at the Bell exhibit. Typical titles were: "Behind the Scenes in a Telephone Exchange"; "What the Maintenance of Good Service Means"; "The Engineering Part of the Work"; "Long Distance Lines Which Reach Fifty Million People"; and "Prompt Service Throughout the Year, Day and Night."

Other expositions held during this period included the Pan-American Exposition, at Buffalo, in 1901, the Lewis and Clark Centennial Exposition, at Portland, in 1905, the Jamestown Centennial Exposition, at Norfolk, in 1907, and the Alaska-Yukon-Pacific Exposition, at Seattle, in 1909.

The Drama at Buffalo

A switchboard, at the Pan-American Exposition at Buffalo, in 1901, was destined to play an important role in a drama of nation-wide importance. Day after day the operators at this switchboard had performed their routine task of making such connections as were required to provide service for the telephones on the exposition grounds. After the first few days, the fact that the switchboard was in full view of the exposition crowds lost its novelty to the operators, and they went about their business much as if they had been in an ordinary operating room, doing an ordinary day's work.

Then suddenly, one day in September, this little switchboard awoke to new life, as if galvanized by a tragedy in which it was destined to play a part. President McKinley, while attending a public reception at the exposition, had been shot by an assassin. Over the wires that ran into this exposition exchange went calls for physicians, nurses, ambulances, police reinforcements. Over them went the first "flash" news which excited reporters sent to their newspapers and news associations. What had been an almost commonplace piece of equipment became, in an instant, the communication center of a nation facing a crisis.

At first, President McKinley's injuries were reported as not alarmingly serious. Vice-President Theodore Roosevelt hurried to Buffalo, was assured that the President's condition was satisfactory, and accordingly joined his family at a camp in the Adirondacks. There, a week later, the telephone brought to him a summons to return to Buffalo, as President McKinley's condition had taken a turn for the worse. Before he could reach there, the President had died, and on his arrival Mr. Roosevelt was sworn in as his successor.

As commonplace as had been the telephone exhibit at the Buffalo exposition, these events, surcharged with drama, had afforded striking evidence of the value of telephone service in times of emergency; had given convincing proof of the importance which communication plays in the life of a democratic nation.

The Panama-Pacific Exposition, 1915

Yet telephone service, though thus proved to be national in its importance, was not nation-wide in its extent. That awaited the construction of the first Transcontinental Telephone Line, completed in the summer of 1914 and used for an experimental conversation just twenty-five years ago this month, on July 29, 1914. The line was formally put in service

on January 25, 1915, about a month before the opening of the Panama-Pacific Exposition at San Francisco.

The Bell System exhibit at this exposition was housed in its own building, the main portion of which was given over to an auditorium. Each seat in this hall was provided with a telephone receiver, with which the guests might "listen in" on coast-to-coast conversations—a long step toward the more elaborate long distance demonstrations of today. Provision was also made for the showing of motion pictures, which were at that time in the "silent" stage of their development.

Organizations were frequently admitted to the auditorium as a group, and members were selected to talk over the Transcontinental Line with speakers at similar gatherings in New York, Boston, Philadelphia or elsewhere on the eastern seaboard, while the entire audience at both ends of the circuit listened to the conversation. An illuminated map traced the route of the Transcontinental Line.

Today, four interconnectable telephone routes link the Atlantic and Pacific, over which flows a steady stream of coast-to-coast telephone traffic, and by means of which networks of specially engineered telephone lines have made nation-wide radio network broadcasting an every-day occurrence. Even for those who rarely or never have occasion to telephone across the United States, it is a commonplace experience to hear voices that come from three thousand miles away, on the far side of the continent. But in 1915 this was a novel and thrilling experience, and crowds thronged the Bell System auditorium, eager to witness the new miracle which science had wrought.

From a telephone standpoint, the Panama-Pacific Exposition —coinciding, as it did, with the birth of nation-wide service —marked a new milestone of progress. Great expositions have been held since then—so many that it is impracticable to describe them here in detail. At almost all of them, some new form of exhibit or demonstration has been employed—but always to present, in new form, the same fundamental message.

Fifty Years of Telephony

The Philadelphia Sesquicentennial Exposition of 1926 marked, of course, a century and a half of American independence. It celebrated, moreover, a half-century of another form of freedom—the emancipation of the human voice from the bonds of time and distance. The Bell System exhibits at Philadelphia gave striking proof of what had been accomplished, as a result of research and experiment by telephone engineers and scientists, during those resultful fifty years.

Here many of the visitors saw and heard, for the first time, that then astounding by-product of long years of laboratory effort in improving telephone service—the talking moving picture. Here, too, for the first time at any exposition, the Public Address System, another product of the Bell Telephone Laboratories, was first employed to bring vast crowds within the reach of a speaker's voice. Accepted almost casually today, such scientific achievements thrilled exposition crowds in 1926 —and that was scarcely more than a decade ago.

So it has been with succeeding expositions. "Oscar, the Dummy with the Microphonic Ears" amused and mystified visitors at the Century of Progress Exposition in Chicago, in 1933, as the Voder does today at New York and San Francisco. Sometimes, as in the case of these two remarkable pieces of apparatus, Bell System exhibits have been designed to entertain as well as to suggest the years of study of sound and of speech that have been required to bring telephone service to its present high degree of efficiency. Often, as in the case of demonstrations of manual switchboards and dial apparatus, the purpose has been to give the visitor a "What's-behind-your-telephone" view of local service. Sometimes, as in the case of the flashing maps which trace the course of circuits used in long distance demonstrations, the purpose has been to show the extent and speed of that branch of telephone service, and its simplicity, from the user's standpoint. Some-

times, as in the case of the Voice Mirror, the purpose has been to show the importance of a good telephone voice and to suggest the vital part which the telephone user himself plays in the provision of the best possible service.

Always, behind these purposes of individual exhibits or demonstrations, there has been another and more fundamental purpose. This has been—and is, at the great expositions now being held in New York and San Francisco—to make it a matter of public record that the experimentation, out of which the telephone was born more than sixty years ago, is still in progress; to restate, in visible and understandable form, the Bell System's purpose of continuing its search for every possible means of improving its service, making it more far-reaching, and rendering it at the lowest possible cost to the millions of Americans in whose lives it plays so vitally important a part.

R. T. BARRETT

The Teletypewriter Helps the Police

BANK HELD UP FEW MINUTES AGO AT EDEN, NY
4 MEN GOT AWAY WITH $10,000
USED LIGHT BLUE SEDAN HEADED SOUTH

POLICE teletypewriters in hundreds of cities throughout New York and adjacent states spell out this "eight-state alarm" and immediately the police of these cities take up the search for the robbers. Sharp-eyed state troopers swing into action at cross-roads, bridgeheads and other strategic points on the highways as they question the occupants of cars that seem to fit the teletyped description. In the cities and towns, municipal police scrutinize incoming motor cars while officers of the State Motor Vehicle bureau search for clues in their records of "stolen light blue sedans." Identification experts in state and city bureaus of criminal identification compare the records of known criminals with subsequently teletyped descriptions of the hold-up men in an attempt to establish the identity of the "mob." The case is broken through the work of a quick-thinking sergeant of police who, connecting several teletyped clues, brings about the arrest of the men by the police of Brooklyn, N. Y. and Cleveland, Ohio.

Speed is vital in spreading alarms and the police have been quick to make use of new fast communication methods which would help them in their war with the criminal element. Everyone is familiar with the highly efficient radio used generally by the municipal police for dispatching "scout" cars rapidly to the scene of crimes. Not so well known, however, are the state-wide police networks of private line teletypewriter circuits, extending over whole states and interconnected with each other and the smaller, city-wide systems connecting station houses with police headquarters. Just as modern business

turned to the teletypewriter for rapid coordination of the activities of factories, warehouses, storerooms and sales offices in different cities, so can the police similarly coordinate the operations of widely-separated State Police posts, municipal police departments and state Motor Vehicle and Criminal Identification bureaus. With the use of teletypewriter many important police cases such as the Eden Bank robbery are solved by the police.

Before the various police organizations in many states were knitted through teletypewriter into what is effectively one great force, the spreading of alarms was a comparatively slow matter. The mails were the principal means by which such alarms could be spread. Printed handbills or postal cards describing the crime and the wanted persons were mailed out by the police to hundreds of police departments in the same state or nearby states. Telegrams were sent or telephone calls were made in those cases where speed seemed particularly desirable. Since reliance upon such telegrams or telephone calls was a form of "shooting in the dark," this method of spreading the alarm was mainly ineffective because usually no one knew the direction of the criminal's flight or his destination. Spreading alarms by mail, while it gave the desired "blanketing," was found to be too slow when criminals took to the use of high speed motor cars and good roads in escaping from the scene of a crime. With fast transportation, a law-breaker often could reach any one of innumerable places dozens or even hundreds of miles distant almost before the police received word that a crime had been committed. There was a need therefore for some method of rapidly blanketing a large area with a police alarm, so that other police departments might be able to intercept the fleeing crooks.

Private line teletypewriter systems and radio cars provided answers to many such police problems. Through the use of these modern, scientific aids to swift communication, the police were enabled to lay down around the fleeing crook an almost

instantaneous barrage of alarms. Should he successfully elude the police at one point, he had still to pass through other and more distant rings of police standing in his way. Private line teletypewriter service enabled the police to distribute almost instantaneously to many fixed points in a wide area, a large volume of printed alarms, which could then be redistributed by other communication methods to radio cars, police booths and other points not equipped with teletypewriter. While both the radiotelephone in cars and the private line teletypewriter systems of the police are fast communication methods, one is not of course a substitute for the other, but rather they supplement each other performing different functions—communication to moving cars being by radio, and communication between fixed police points being by teletypewriter.

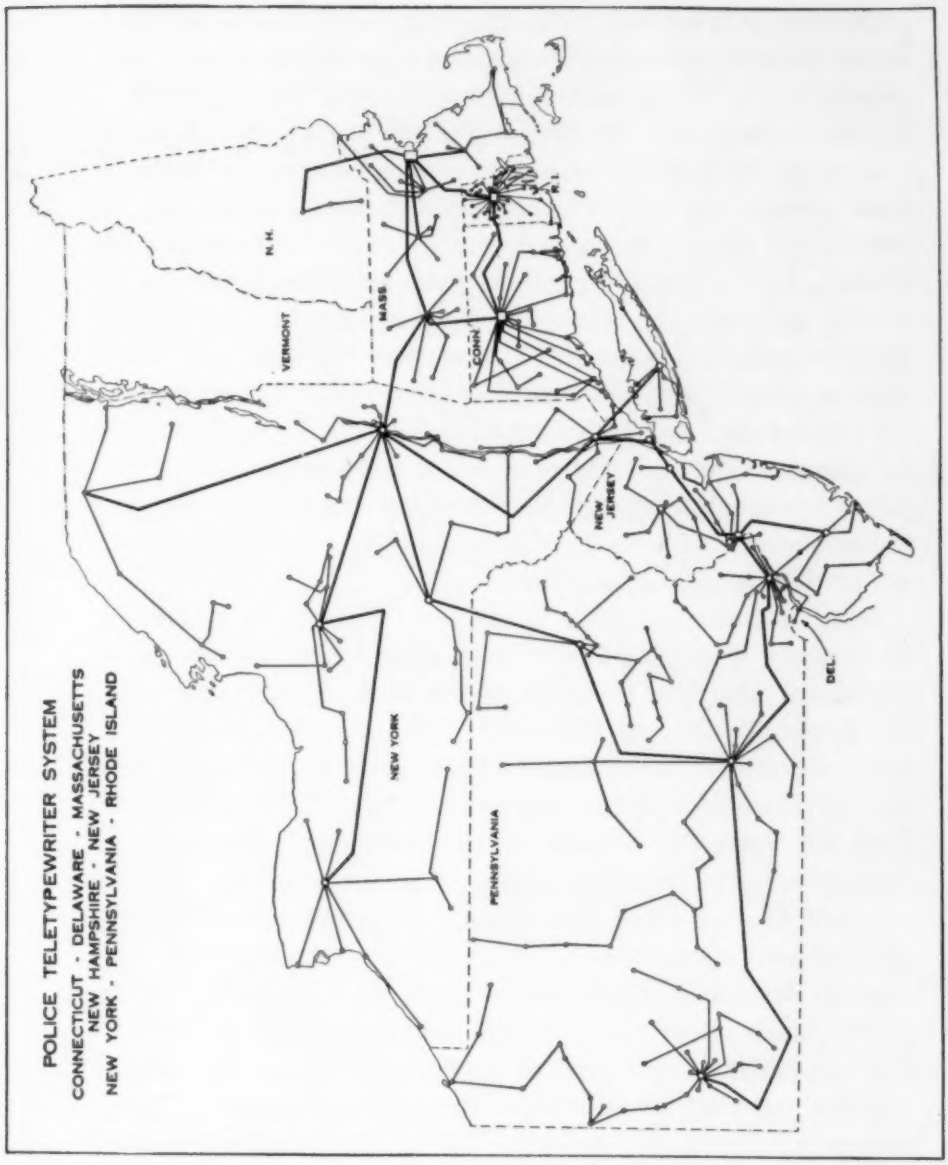
The small town resembles the large city in having its share of homicides, robberies and frauds, as well as the non-criminal problems of locating missing persons, identifying amnesia victims and recovering lost property of citizens. Thus, the police forces of the small towns also have need for flashing their alarms to other police. The police say that criminals from the large cities often "knock off" a bank, store or gas station in a small town, fleeing afterward to their hideout in the large city. The Bank of Eden robbery was one such case. Teletypewriter, through its two-way feature (transmission of intelligence in either direction), is of incalculable value to the police of small towns because through its use they can send out calls for help to thousands of brother police in distant cities and, also, keep informed as to criminals wanted by other police departments. A small community ordinarily could not afford to make a general distribution over great distances of the alarms which they originate and the state-wide private line police teletypewriter system, supported principally by the state, is an invaluable service to them. The only type of communication system which satisfactorily meets the needs of the police is one which promotes usage of the system by all police or-

ganizations involved, large and small. This the state-wide private line teletypewriter system does.

Police teletypewriter systems have grown from a single system in use by a group of Connecticut municipalities in 1927, to the point where systems now in service cover the additional states of New York, New Jersey, Massachusetts, Rhode Island and Pennsylvania, with connections to parts of Delaware and New Hampshire. A state-wide system also is in service for the police in California, and other states are actively considering the installation of systems. Many metropolitan cities and counties, some in states not having state-wide systems, have also equipped their police with teletypewriter connections between headquarters and precincts or outlying communities. The teletypewriter machines, interconnecting circuits and associated switchboards are, in general, furnished by the Bell System and are similar to the equipment provided in the private line service used by business organizations and the press.

The Eight-State Police Teletypewriter System

Readers of Eastern newspapers often see references to the police sending out an "eight-state alarm." These alarms are sent out over the private line teletypewriter systems of the police in the group of eight Eastern states named above. The state and municipal police in these states, through interstate teletypewriter connections which tie together key points in the various state-wide systems, can function practically as a unit in their operations. They form the so-called "Eight-State Police Teletypewriter System." This network is, in effect, a gigantic alarm system by which police in one city can spread alarms to the police of 350 other communities, and serves day and night to protect 35,000,000 people throughout 125,000 square miles, an area approximately equivalent to that of Great Britain or of Italy.



PRINCIPAL CIRCUITS OF THE EIGHT-STATE POLICE TELETYPEWRITER SYSTEM

Because the automobile is used so extensively in connection with crime, it is necessary that the police work closely with the motor vehicle registration bureaus of the various states. To provide access to the motor vehicle records, the Eight-State system connects with the Motor Vehicle Bureau in each state covered by the system where there is such a bureau. Through these connections, state and municipal police units are able to make rapid checks on car and driver licenses. The police of Buffalo, New York, for example, have no difficulty in determining, say, from the Motor Vehicle Bureau at Hartford, Connecticut, that an abandoned Connecticut car has previously been reported as stolen or that a car driver, suspected of operating a stolen car, has a police record of convictions for car thefts. As a result of this cooperative effort, as much as one-half of the police communications handled over the state-wide teletypewriter systems have to do with automobile registration information in one form or another.

Another important factor in police work is the State Bureau of Criminal Identification. Functioning under this or some equivalent title, the bureaus are the modern counterparts of the Rogues Gallery of yesterday. The bureaus are, for the states which they serve, central depositories for records of the various police departments and penal institutions in each state. Here are kept the records of criminals, their photographs, finger-print classifications, aliases, and the extensive *modus operandi* files in which the characteristic methods of known criminals are described. Teletypewriter connections to the Bureaus from the Eight-State network flash annually to the police thousands of clues through which criminals are identified, apprehended and eventually convicted. Also, in connection with criminal identification, the police make use of Teletypewriter Exchange Service ("TWX") to furnish information to the Federal Bureau of Investigation at Washington, or to receive information from that Bureau.

THE TELETYPEWRITER HELPS THE POLICE

TRENTON NJ GB 881 7-16 PM FEB 9

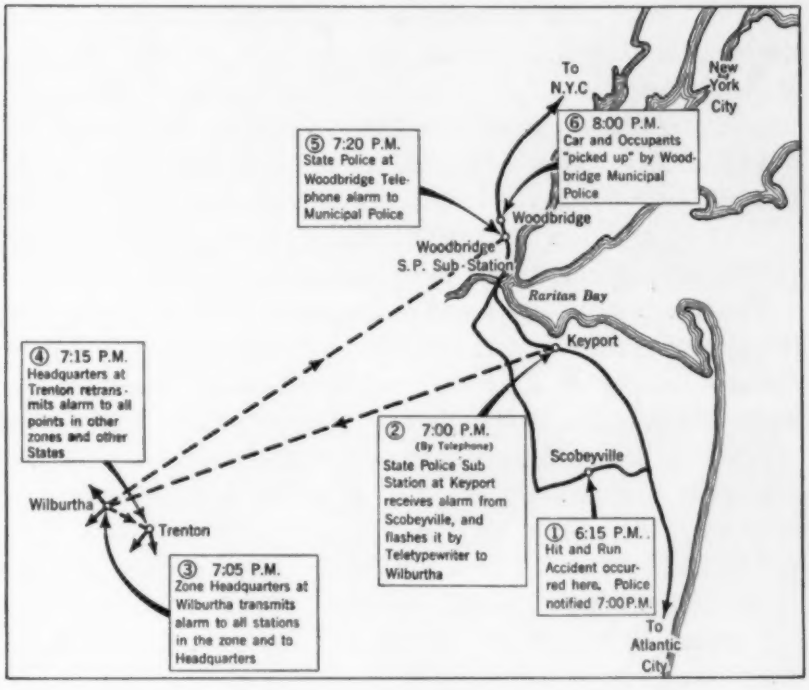
WANTED FOR HIT AND RUN

OCCUPANTS OF A PACKARD TOURING CAR

REG. 8-A4972

STRUCK AND INJURED A WOMAN AT SCOBEYVILLE NJ ABOUT 6-15 PM THIS

DATE ANY INFORMATION NOTIFY STATE POLICE KEYPORT NJ


To N.Y.C
New York City
⑥ 8:00 P.M. Car and Occupants "picked up" by Woodbridge Municipal Police
⑤ 7:20 P.M. State Police at Woodbridge Telephone alarm to Municipal Police
Woodbridge
Woodbridge S.P. Sub-Station
Raritan Bay
Keyport
④ 7:15 P.M. Headquarters at Trenton retransmits alarm to all points in other zones and other States
② 7:00 P.M. (By Telephone) State Police Sub Station at Keyport receives alarm from Scobeyville, and flashes it by Teletypewriter to Wilburtha
Scobeyville
Wilburtha
Trenton
① 6:15 P.M. Hit and Run Accident occurred here. Police notified 7:00 P.M.
③ 7:05 P.M. Zone Headquarters at Wilburtha transmits alarm to all stations in the zone and to Headquarters
To Atlantic City

TRENTON NJ RE GB 881 8-12 PM FEB 9

CANCELATION WANTED FOR HIT AND RUN

OCCUPANTS OF CAR REG. 8-A-4972 NY

APPREHENDED BY WOODBRIDGE TWP. NJ POLICE

AUTHORITY STATE POLICE WOODBRIDGE NJ

APPREHENSION BY WOODBRIDGE, NEW JERSEY, MUNICIPAL POLICE OF A HIT AND RUN CAR WANTED BY THE STATE POLICE OF KEYPORT. Illustrating the path of the alarm which intercepted the hit and run car, and the action of the various police groups involved.

Private line teletypewriter systems enable the police to "cancel" alarms at hundreds of points by the same simple process as that through which the original alarms were sent out. Thus, much useless expense and dangerous police work has been saved, for the police must vigorously prosecute each case on which there is an outstanding "uncanceled," that is, unsolved alarm. An example of the necessity for the alarms to be canceled on closed police cases to all other police points, is the not uncommon situation in which an automobile has been reported stolen, when in reality it was only borrowed by a relative or friend, and has been in due course returned. Police carrying out their duties may be led into the use of firearms in stopping this car, even though it may be in charge of the rightful owner. Prompt cancelation of closed alarms, afforded by the teletypewriter, helps prevent such mishaps.

The number of alarms and messages handled each year over the teletypewriter systems of the eight-state network has increased sharply as state and municipal police forces learned how effective it was in their work. The New York State Police System, for example, now handles annually more than 300,000 alarms, reports and other police messages, compared with one-third of this traffic in its first full year of operation in 1932, and the Pennsylvania Motor Police System is handling in excess of 125,000 communications annually, compared with an average annual traffic of one-third of this figure in the first three years of operation beginning in 1929.

Tangible results from the use of teletypewriter in police work are seen in figures supplied, for example, by the New Jersey State police. In one year criminals were apprehended or stolen property was recovered in 1376 cases through information sent over the police teletypewriter system in that state.

How an Alarm is Handled

As an illustration of the operation of the Eight-State system, consider the common case of an automobile theft. A citizen

LIEUTENANT JOHN E. MURNANE OF THE NEW JERSEY STATE POLICE WATCHES THE RECEPTION OF A TELETYPED ALARM ON A MACHINE IN THE TRENTON HEADQUARTERS OF THE NEW JERSEY STATE POLICE TELETYPEWRITER SYSTEM. The extensive teletypewriter files of the police are kept in cabinets along the wall at the left.

THE PENNSYLVANIA MOTOR POLICE TELETYPEWRITER HEADQUARTERS AT HARRISBURG FURNISHES THE POLICE OF A HUNDRED PENNSYLVANIA COMMUNITIES WITH ALARMS AND OTHER POLICE REPORTS

HEADQUARTERS OF THE MASSACHUSETTS STATE POLICE TELETYPEWRITER SYSTEM AT COMMONWEALTH PIER, BOSTON. Police alarms are flashed from here to police points throughout Massachusetts, and to the police in the neighboring States of New York, Rhode Island, New Hampshire and Connecticut.

PRIVATE LINE TELETYPEWRITER SERVICE SERVES THE POLICE OF THE SMALLER MUNICIPALITIES AS WELL AS THE LARGER ONES. Chief of Police John C. Dempsey of the Olean, New York, Police Department is shown inspecting the teletyped report of some "bad actors" wanted by other police.

telephones to his local police department and reports that his automobile has disappeared. He tells the police the make, year, color, and the license and motor numbers of the car. A police officer types out the alarm on the keyboard of the teletypewriter. The keyboard is similar to that of an ordinary typewriter and as each letter is depressed at the home machine, the corresponding letter is typed on all other machines which may be connected to the circuit. The copy thus typed out (at speeds up to 60 words a minute) is letter width size, and frequently the machines are arranged to provide carbon copies at some of the larger police points where extra copies of alarms and reports are of advantage to specialized police groups, such as the automobile, homicide and missing persons squads.

The alarm thus typed out reads as follows:

STOLEN CAR, REGISTRATION B–12974 BUICK 1938 SEDAN, BLACK, MOTOR NO. 9870482.

This alarm, when it is received at the headquarters of the state system is consolidated with other stolen car alarms and the combined information started on its way to points throughout the state and to the other states in the network. Key points in the neighboring states receive the various alarms. The key points in turn spread the alarms throughout their own states and to other states to which there are teletypewriter connections. County and city systems carry the report to precincts and station houses. The information as to the stolen car may in this way be known within 15 minutes to detective bureaus, automobile and traffic squads, Motor Vehicle Bureaus and State Police troopers throughout the eight states.

When the state police stations receive an alarm over the teletypewriter system, they post the car number in the barracks where the troopers may take note of it as they come from or go on duty. Municipal police units note the alarm on the "blotter." The alarm is read to the shifts next going on duty together with other alarms, police reports and instructions. Men

detailed for traffic duty jot down the car numbers contained in the alarm before they go on shift. Motorized traffic police sometimes carry the information, given by the alarm, on a card placed under the transparent backing on one gauntlet, or the original teletypewriter copy may be carried in this way. When the hand is raised to halt a car, the wanted car number is in easy line of sight with the license plate of the stopped car. Besides being telephoned to other police points, the teletypewriter alarm may be passed to motorcycle officers through the device of telephoning roadside gas stations, dining places or refreshment stands, to "flag" the officer to stop and receive the message. A "disk" or flag sometimes is displayed for this purpose. State and municipal police points equipped with transmitting equipment, relay the teletypewriter alarm by radiotelephone to police in automobiles in the city and on the highways.

Reproductions of several police alarms are shown herewith in illustrations and in the text. While the alarms are actual police records, the names of the people concerned have been deleted and wholly fictitious names substituted in their place.

Point-to-Point Police Information

In addition to the flow of alarms to all points, the various state-wide police teletypewriter systems carry many criss-crossing queries and answers as clues are hurriedly sought, suspects examined and "tips" passed from one police force to another. Speed is again the important thing in this traffic. Some of the thousands of such messages read as follows:

Information please on 4NY19–18.

Please forward fingerprints of Van Doran killed by Capt. Williams of your department during holdup. We have several chain store robberies and would like to check on this man.

THE TELETYPEWRITER HELPS THE POLICE

TRENTON NJ GP 7383 NEWARK NJ 9101 8-7
WANTED FOR ATTEMPTING TO PASS COUNTERFEIT MONEY
2 MEN
OCCUPANTS OF A CHEVROLET COUPE
REG E - 725 PENNA
ATTEMPTED TO PASS A COUNTERFEIT $10 BILL. BOTH MEN HAVE
A QUANTITY OF COUNTERFEIT MONEY IN THEIR POSSESSION
ANY INFORMATION NOTIFY SCOTCH PLAINS NJ POLICE 6-22' PM
NOTE HBG PA-- KINDLY FURNISH INFORMATION ON ABOVE REGISTRATION

PHILADELPHIA TO NEWARK NJ 8-7
REF- GP 7383 WANTED FOR ATTEMPTING TO PASS COUNTERFEIT
MONEY
TO SCOTCH PLAINS NJ POLICE-- REG. E - 725 PENNA ISSUED
TO IRENE K. PURSELL 777 17TH AVE BEAVER FALLS PA FOR FORD SEDAN
MOTOR A - 390072 - S.P. HARRISBURG PA. 7-53 P.M.

TO SCOTCH PLAINS NJ POLICE
MOTOR PATROL BUREAU ARE HOLDING 2 MEN AS PER YOUR ALARM AT 6-18
THIS P.M. NEWARK NJ ZB 9101
NO. 1. KENNETH RODNEY, CONNECTICUT AVE. WASHINGTON D.C.
NO. 2. HARRY MICHEL, 44TH. ST. NORTH-WEST, WASHINGTON D.C.
THESE MEN APPREHENDED AND HAVE IN THEIR POSSESSION $135 IN 5
AND 10 DOLLAR BILLS WHICH ARE COUNTERFEIT. KINDLY ADVISE.
JERSEY CITY NJ POLICE 8-23 PM

NEWARK NJ 9101 NY 12068 SCOTCH PLAINS POLICE ALARM 8-7
CANCELATION-WANTED FOR ATTEMPTING TO PASS COUNTERFEIT MONEY
2 MEN OCCUPANTS OF CHEVROLET COUPE E-725 PENNA. APPREHENDED BY
JERSEY CITY NJ POLICE MOTOR PATROL - AUTHORITY JERSEY CITY NJ
POLICE 8-25 PM "RT"

THROUGH TELETYPEWRITER SERVICE THE SMALL POLICE DEPARTMENT OF SCOTCH PLAINS, NEW JERSEY, SECURES THE HELP OF JERSEY CITY POLICE IN APPREHENDING PASSERS OF COUNTERFEIT MONEY. Included in the alarm is an "automobile registration request" directed to Harrisburg, as a result of which the registered owner of the car used by the counterfeiters was established.

Be advised that the Russell Kelley wanted by you may be in possession of a Packard Coupe color gray registration E–45909 on door are initials " R. J. J." Stolen from this city March 30.

"Look-ups" directed to automobile bureaus, such as the first message illustrated above, result in replies which give to the police information as to the make, color, year, model, engine and serial number of the the cars bearing the indicated license numbers. These records also show which cars have been reported stolen. Forgeries of automobile registration certificates, transferred license plates and mutilated engine or serial numbers can thus be detected almost immediately. Similarly the police send requests for "look-ups" to the motor vehicle bureau for data on the holders of motor vehicle driving licenses. Forged operators' licenses are easily detected and frequent offenders readily identified through these requests. Private line teletypewriter service is a direct path into the motor vehicle and police departments connected to the system, for the exchange of this kind of information.

Finger-Print Records

The value of the rapid transmission of fingerprint information between police departments is one whose importance is clear to all. That this information may be transmitted by teletypewriter is not, however, generally known. Letters and numerals are used to describe the characteristic form and number of the lines in the print of each finger; for example, U and R indicate, respectively, the fingerprint "ridges" flowing in the direction of the ulnar and radial bones of the arm, while the figures designate the number of these ridges which may be counted between certain reference points in the print. A substantial use is made of the eight-state system for spreading alarms containing fingerprint information. The following is a fingerprint record as transmitted over the police teletypewriter:

	THUMB	INDEX	MIDDLE	RING	LITTLE
RIGHT	U–11	U–9	U–12	R–8	U–10
LEFT	R–5	R–10	U–12	R–11	U–9

Coordination with Other Communication Methods

The police use various other communication methods to spread alarms. The use of radiotelephone to flash alarms to police cars from headquarters has already been mentioned. There is also an exchange of alarms between the police on the Eight-State Teletypewriter System and radiotelegraph stations of the police located in several mid-west cities. This exchange is carried out by the municipal police department at Buffalo, New York.

The police also make a wide use of the telephone for communication with points not connected to the teletypewriter network. Police points receiving alarms via teletypewriter, frequently relay these alarms to other strategic non-teletypewriter points by telephone. An instance of the use of the telephone in this way, was the arrest of the robbers of the Bank of Katonah, N. Y., when the police of the small village of Armonk, N. Y., 15 miles away, acting on a telephoned alarm, dragged the wanted men from under the rumble seat cover of an automobile and recovered a paper bag containing $18,000 taken from the bank a half hour earlier. Small police departments without teletypewriter service, or equipped only with teletypewriters for receiving, often telephone in their alarms and requests for information to a two-way police teletypewriter station, at which point the communications are transmitted over the state-wide system. The New Jersey State Police zone headquarters at Newark handles annually upwards of 39,000 such requests from the police of 60 neighboring communities. The telephone is also used to take advantage of the quick, personal contact afforded by this form of service in those matters which require discussion and interchange of views between police officials.

Telegraph message service is also used by the police, as for example, when the police of distant cities are to be informed of arrests which have been made, especially those made as a result of an alarm sent out by the distant department. Data as to criminal records and fingerprints are also often furnished in this way. Missing persons from the smaller cities are often reported by telegraph to the police of the larger cities, such as New York, Chicago and Los Angeles.

Teletypewriter Exchange Service, as already mentioned, is sometimes used to communicate with the Federal Bureau of Investigation in exchanging identification information. It is also used to communicate with certain other police points in states with no private line networks.

Mail is also used extensively for nation-wide broadcasts of alarms, where descriptions of wanted persons are sent to thousands of post offices and police departments.

Systematizing Communication by Teletypewriter

Under earlier communication methods, an alarm, for example, might be sent out by radio, replied to by a telephone call, and again replied to by telegraph or even by mail. The resulting mixture of written record communications and unwritten or fragmentary notes of conversations, often made the police unwilling to depend on such incomplete memoranda for important data. The written record feature of the teletypewriter, on the other hand, made simple and practicable the establishment of uniformly typed copies identical at all points.

The written record feature is also of great value to the police in making their communications as nearly as possible free from errors. Police communications contain many numerals and significant letters. Numerals are frequent in automobile data (license and motor numbers) and in descriptions of lost pistols, electric drills and typewriters. Initials, of course, are important parts of persons' names. Numerals and letters both are employed in the important finger-print classifications. Errors

made in the transmission of any of these characters may be costly to the police and to the public. Teletypewriter helps to guard against error and fixes responsibility unquestionably by providing a clearly typed copy of all matter transmitted over the system.

The typed copy is made without it being necessary for anyone to be present at the receiving end. At the smaller police points, a single attendant may be engaged in taking down a complaint over the telephone, booking a prisoner or may even be absent from the police station. Teletypewriter makes it possible for alarms to be received while he is thus engaged.

An important part of the work of the police at headquarters is to sort the alarms, messages and other police information turned out hourly from the teletypewriters, and then to file the information in a way which will permit quick reference when related alarms are reported and cancelations of alarms on closed cases are to be sent out. The police consider, therefore, that their files are "live" records of utmost value. Therein are found the names, aliases and descriptions of the thousands of "wanted" persons for whom the police are looking at any one time. Crimes are described in those files in connection with which usually few or only fragmentary clues are available. The police go to great lengths to classify all the information they receive in such a way that the barest of clues—a scar on a man's face, a stolen electric drill, a Gypsy's method of flim-flam—will lead them to the law-breaker. The easily-filed letter-width copy from the teletypewriter, lends itself to simple and uniform filing methods making speedy reference and certain cancelation possible.

Teletypewriter Helps in Many Types of Police Work

Improved results in police operations, attributable to the use of teletypewriter, have strengthened police hands to the point where crooks often think twice before deciding to rob a particular bank, or gas station because troopers or other police

nearby or on their route of escape have a teletypewriter connection to a state-wide system. Thus teletypewriter helps to pre-

46 FILE 8 FROM SP ONEIDA SEPT. 5
TO- GENERAL ALARM
WANTED FOR HIGHWAY ROBBERY THREE UNKNOWN WHITE MEN TRAVELING
IN A YELLOW BUICK TOURING CAR. FIRST PART OF LICENSE NUMBER
5-X LAST NUMBERS UNKNOWN. BEST DESCRIPTION OBTAINABLE AS FOLLOWS--
NUMBER 1 BUSHY HAIR, WEARING A LEATHER COAT
NUMBER 2 COMPLAINANT STATES HE NOTICED THIS MAN HAD MANY
WARTS ON HIS HAND.
THESE MEN AND CAR WERE IN THE VICINITY OF OHIO N.Y. YESTERDAY.
AUTHORITY
SERGT. ROPER SP CORPORAL DENNISON 11-54 AM

56 FILE 8 FROM SP MONROE SEPT. 23 REPLY
SP.ONEIDA
REFER YOUR MESSAGE 46 FILE 8 SEPT. 5
WE HAVE PICKED UP THE MEN AND CAR WANTED BY YOU. FOUR MEN WERE
RIDING IN A YELLOW BUICK TOURING CAR AND WHEN QUESTIONED BY ONE
OF OUR PATROLS THE NUMBER OF WARTS ON THE HANDS OF ONE WERE
NOTICED. THREE OF THESE MEN ARE FROM JERSEY CITY N.J. AND ONE FROM
DELHI N.Y. THEY ARE BEING HELD AT THIS SUBSTATION. THREE OF THESE
MEN ARE WANTED BY THE PD AT KEARNY N.J. FOR ROBBERY. THEY ARE
ALSO SUSPECTED OF A ROBBERY IN MIDDLETOWN N.Y. ONE OF THESE MEN
ADMITS BEING WANTED IN DELHI N.Y. FOR FORGERY AND PETIT LARCENY
AND ALSO IN ONEONTA N.Y. FOR FORGERY AND FRAUD ON AN INNKEEPER.
HE ALSO ADMITS HAVING SERVED TIME AT ELMIRA REFORMATORY. THEY
ALSO KNOW SOMETHING OF THE ROBBERY OF A GAS STATION NEAR COLLIERS
N.Y. WHERE THE ATTENDANT WAS HIT OVER THE HEAD. PLEASE SEND YOUR
TROOPER TO THIS STATION FOR FURTHER CHECK-UP ON THESE MEN.
AUTHORITY TROOPER RISLEY LIEUT. GEORGE 9-37 AM

TELETYPEWRITER CIRCUITS OF THE NEW YORK STATE POLICE CARRY A GENERAL ALARM REPORTING A HIGHWAY ROBBERY IN WHICH ONE OF THE ROBBERS WAS OBSERVED TO HAVE WARTS ON HIS HAND. Teletypewriter carries thousands of such clues annually through which the police are helped in apprehending criminals.

vent crime. An instance of the application of teletypewriter in this way is the exchange of hotel fraud information between

the New York Hotel Men's Protective Association and officials of the New York State Police. Member hotels display at the cashier's window a metal sign reading "This hotel protected by New York State police teletypewriter system." Hotel men say that since they have displayed these signs, they have sub-

BOSTON 231 APRIL 10 1939 915PM
JUST ESCAPED FROM CHARLESTOWN STATE PRISON
JOHN CRAMER 32 -5-4-122, SALLOW COMPLEXION, LITE BROWN
HAIR, BLUE EYES, HOME IS ON CAMBRIDGE ST., LOWELL, WEARING PRISON
CLOTHES.
THIS MAN MAY GO TO THE HOME OF FRIENDS IN LOWELL.
HE IS DOING LIFE FOR 2ND DEGREE MURDER AND HAS BEEN CONFINED SINCE
1926. SPECIAL ATTENTION LOWELL P.D.

FINIS

MEDFORD 251 APRIL 10 1939 1030PM
THAT JOHN CRAMER HAS BEEN ARRESTED BY THE DEPT.
WHEN ARRESTED HE HAD A FULLY LOADED COLT AUTOMATIC
GUN ON HIM.
JUST BROUGHT THIS MAN IN.
THEY ARE BOOKING HIM NOW.
BOSTON PLEASE TAKE NOTICE.

FINIS

APPREHENSION OF ARMED ESCAPED PRISONER BY MEDFORD, MASS., POLICE BASED ON A BOSTON TELETYPED ALARM. Speedy teletypewriter service brought about arrest in 1 hour 15 minutes from the time the alarm was sounded.

stantially cut their losses from "skippers" who leave without paying their bills, and "charmers" who pass worthless checks.

Another instance, one which the police say has its counterpart every day in police work, was the apprehension of a group of boys from a New England state who had stolen an automobile and set out on a life of crime which might have ranged from simple pilfering up to murder of some gas station atten-

dant for the few dollars which could be obtained. In cases like this one, the police are usually without information as to the direction taken by the boys. Through rapid blanketing of the eight-state area by teletypewriter, however, the police in a nearby state were enabled to arrest the boys before they could commit other and more serious crimes.

Turning to some of the work the police do which is of a non-crime nature, the teletypewriter is found to enable police to perform many additional services of great value to the public. Some of these services could hardly have been rendered through any other agency than the state police. In one such case from the records of the police, in which again the blanketing value of teletypewriter service was demonstrated, a baby's life was saved from poisoning. The police alarm, teletyped in all directions, was as follows:

> 8-State Alarm—please stop a Chevrolet car license G—W— Motor 8—, car is occupied by a man named C. E. B.— with his wife and baby. They took a bottle supposed to be medicine contents of which was to be administered to the baby. The bottle they have contains poison—1 per cent. atropine sulphate. Poison bottle was taken by them by mistake please make every effort to stop this car and warn them of danger. If supposed medicine has already been administered to the baby use any emetic as antidote.

An hour after this alarm had been sent out a patrol nearly a hundred miles distant from where the error had been made recognized the car. The "cancelation" which followed said "Baby out of danger, only one small dose of poison administered."

Helen ——, a demented woman, visiting in a seaside resort, had nearly asphyxiated herself and 5 children she had with her, when police of a nearby state, acting on a teletyped alarm from her home city nearly 200 miles away, broke into her boarding house room in time to save all six lives. It had taken only an hour for the police to find her. No one knew where she was.

The police in her home city had sent the teletyped alarm in all directions on the eight-state system. The police in the resort spotted her parked car by its license number and a few inquiries led them to her room in a nearby boarding house.

Agnes —— was identified by the police of a New England city from information contained in a teletyped alarm describing an amnesia patient in a hospital located in another State in the system. Police who found her did not know where she belonged, but the teletyped alarm to all police departments of the eight states furnished the right clues to the proper authorities.

Other examples are given in the accompanying reproductions of actual police messages. Used freely by the police of all the connected communities, the eight-state system thus aids the police in solving the innumerable routine cases which form a large part of their day-to-day activity.

Teletypewriter Benefits from Police Cooperation

While teletypewriter and radio have been important factors in making it possible for the police to cooperate actively, the effectiveness of these communication systems is due in large measure to the attention which the police officials in charge of the systems have given to the many problems involved in exchanging information between various states. In working out suitable procedures for handling the interstate traffic, police officials concerned with the operation of the eight-state network customarily meet once a year for discussion of their communication problems at a Teletypewriter Supervisors' Conference in New York City. Many of these officials are also members of the Associated Police Communication Officers, a national body of police officials primarily concerned with radio and teletypewriter communications. The two organizations work closely together through joint committees established for the study of traffic problems and the legal and other

questions looking toward the more expeditious and accurate handling of police teletypewriter and other forms of communications.

In reviewing the place of teletypewriter service in police work, it is evident that the police have need for an alarm distribution system which will deliver alarms in volume, immediately, over great distances and to a large number of police departments. The broader such distribution is the greater is the chance that the criminal will be apprehended.

With teletypewriter service the police now send their alarms far beyond the range of earlier methods, almost instantaneously, and to hundreds of places simultaneously. Police work as a result has been made increasingly effective as the long arms of the teletypewriter systems reach out to guard in an ever greater area the lives and property of millions of people. The teletypewriter in police hands thus is one answer to the underworld's challenge to the safety of society, and an invaluable aid in crime prevention.

HOWARD HUNTER

Automotive Equipment and Construction Apparatus in Telephone Company Service

THE Bell System Automotive Equipment is relied upon to perform a broad range of functions in addition to providing the usual transportation service. These additional services of a more or less special nature are made possible by adaptations of generally available cars and truck chassis. The power of the truck engine is utilized to drive a variety of types of special auxiliary apparatus, and the motor vehicle bodies in general are designed to suit the particular requirements of the classes of work done by the men who use them.

The field requirements as regards kinds of auxiliary apparatus and also types and sizes of vehicle bodies, vary through a considerable range; and the minimum number of types of special telephone vehicles which are required to provide the service, multiplied by the considerable number of makes of chassis which the Associated Companies find it desirable to use, results in numerous combinations. This is true despite the fact that efforts are always made to broaden the application of each particular type and size, thus minimizing the number.

In this article, first there will be discussed some of the current major considerations in engineering the world's largest company owned motor vehicle fleet, and then there are some recent important developments in the field of the power operated apparatus for outside plant construction and maintenance work which will be briefly touched upon.

Composition of the Fleet, and Trends

The fleet at present consists of about 20,600 vehicles belonging to the various individual companies which make up the

Bell System. As indicated by Figure 1, except for the decrease of about 2,500 between 1930 and 1933, the growth has been practically continuous, from a total of 2,000 vehicles in 1914 to the present time, showing an average expansion of something like 800 new vehicles per year. This, of course, is in addition to the annual turnover in connection with replacements, which now introduces approximately 4,000 new cars and trucks per year into the fleet. These figures are mentioned to show the extent of the opportunity continuously to improve the fleet by proper selection of cars and chassis and by the use of equipment on them representing the latest designs.

It is interesting to note the present distribution of the vehicles as grouped in Figure 2 according to carrying capacities. The number per group increases very rapidly as the size of the vehicle decreases. From an investment and operating cost viewpoint, however, the larger size trucks would show up very much more prominently than indicated by this chart. For instance, the first cost of one 5-ton capacity, type SD supply delivery truck complete would equal 8 of the type LIU half-ton light installation trucks, 5 of the type CLM cable and line maintenance trucks on 1 ton chassis, or 3 of the type LCW light construction winch trucks on 1½ ton chassis.

The SD truck (Figure 3) carries the various kinds of materials required, from the central storeroom to work trucks in outlying garages. This traveling storeroom serves the work trucks while they are idle, at night. The LIU truck (Figure 4) is used by one or two workmen for installing telephones and associated equipment on the subscribers' premises. The CLM truck (Figure 5) serves cable splicers doing principally maintenance work, and also small crews of maintenance men handling pole, wire and aerial cable line work. The LCW truck (Figure 6) is equipped for light pole line and cable construction, but also does considerable maintenance work.

In recent years, there has been a great increase in the number of ½ ton vehicles in the fleet. In the last four years

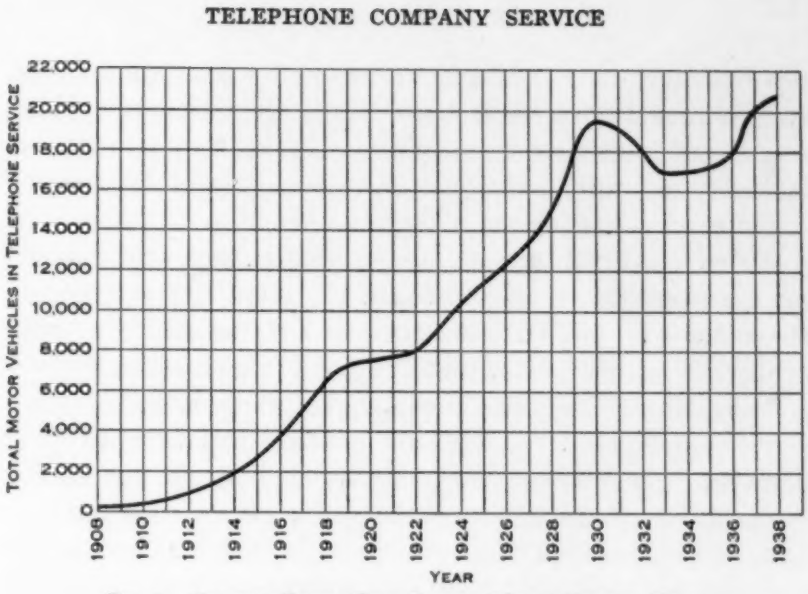


FIG. 1. GROWTH CURVE, BELL SYSTEM MOTOR VEHICLE FLEET

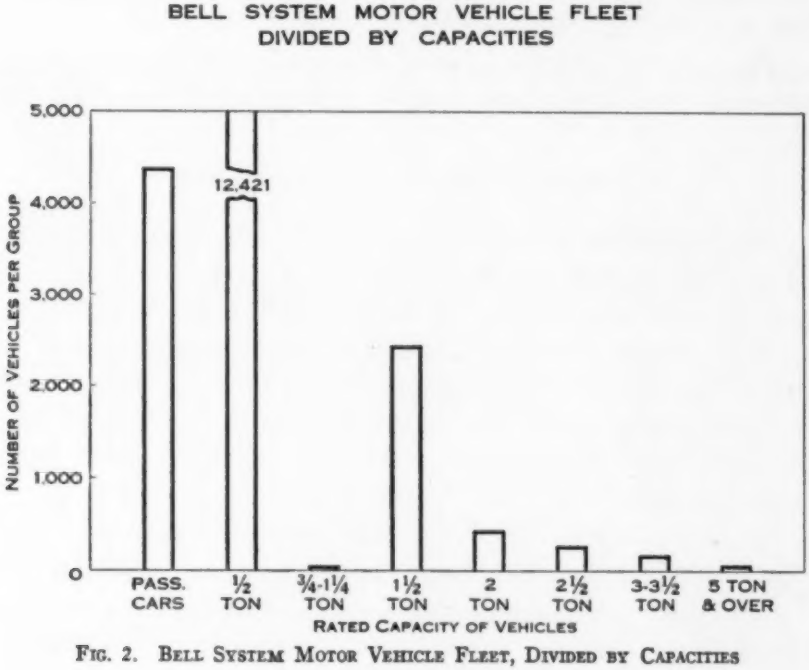


FIG. 2. BELL SYSTEM MOTOR VEHICLE FLEET, DIVIDED BY CAPACITIES

reported, they have increased in number by about 35 per cent. In this period there have been smaller increases in 1½ ton trucks and passenger cars. Other sizes of trucks have remained practically unchanged in number, except for the 2½ ton size which has shown a slight tendency to decrease.

There is a trend in truck designs and ratings which should not be overlooked. To illustrate the point, let us compare the older 1½ ton HF construction and maintenance truck (Figure 7) with the LCW unit (Figure 8) which has now about replaced it. The net pay load carrying capacity in telephone service of the earlier truck is 2,700 pounds compared with 4,000 pounds for the later one, and yet they are both 1½ ton trucks.

The LCW truck of 50 per cent greater net carrying capacity costs only 30 per cent more. Due to the more substantial construction of the chassis, body and power equipment, it should last somewhat longer, and the overall cost per day of the present 1½ ton LCW trucks should be actually lower than for the HF models.

The same general line of reasoning applies also to other sizes of trucks and particularly to the much used half-ton size.

Selection of Motor Vehicles

A consideration of these facts bears directly upon the matter of present-day selection of motor vehicle equipment for each particular kind of work. In a great many cases it is advantageous to select a seemingly lighter class of vehicle than it has been customary in the past to use for the job. Where this is done within reason, the costs should be lower and yet the performance and usefulness of the unit should be better than with the replaced truck.

In discussing selection of chassis, an important consideration now which may pay large dividends in the future has to do with obtaining types of trucks with adequate power for the operating conditions. Present-day highway traffic conditions

FIG. 3. SD, SUPPLY DELIVERY TRUCK

FIG. 4. LIU, INSTALLATION CAR WITH UTILITY TOP UPON WHICH SUPPLIES OR BRUSH CAN BE CARRIED.

FIG. 5. CLM, CABLE AND LINE MAINTENANCE TRUCK

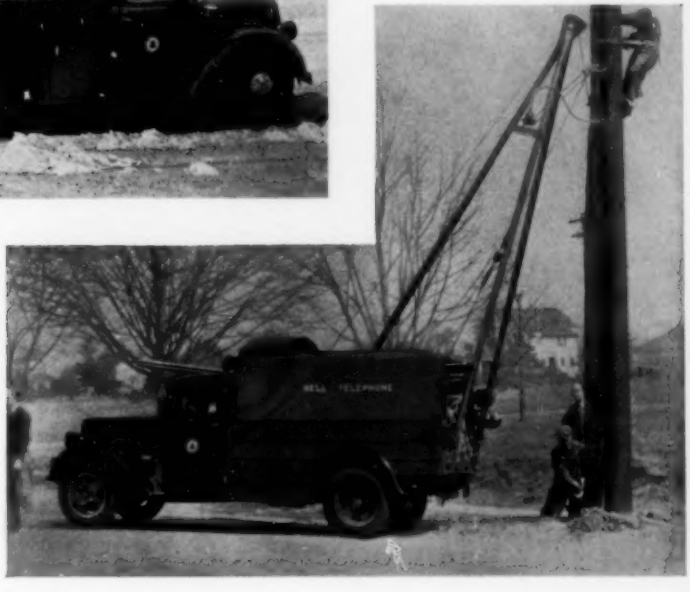


FIG. 6. LCW, LIGHT CONSTRUCTION, WINCH TRUCK.

FIG. 7. RECENT TYPE 1½ TON CONSTRUCTION TRUCK, HF.

FIG. 8. PRESENT STANDARD 1½ TON CONSTRUCTION TRUCK, LCW.

FIG. 9. 5-MAN CAB ON "ENGINE UNDER SEAT" TRUCK.

FIG. 10. 5-MAN CAB ON "CAB-OVER-ENGINE" TRUCK.

and vehicle designs are such as to suggest the possibility that in the future certain minimum power-load factors (horse power for load carried), may be required for all vehicles. In level territories naturally this matter is not as important as in areas where hills are encountered. But in all cases when selecting the vehicle, care is taken to secure adequate engine power with suitable available gear reductions. Vehicles which will regularly haul trailers are considered upon the basis of the total load of truck and trailer, and powered accordingly.

Another point which should be mentioned in connection with selection, has to do with a proper understanding of the relation between what might be called standard and optional parts of the equipment, which was mentioned earlier herein. Many things about a telephone truck are generally required, such as the tool and material compartments. These could be considered as standard. Then there are other things which might or might not be required on the truck, depending upon the local conditions and the work in hand and planned for the future. For instance, a ladder platform might be considered as an optional item for a CLM truck. It is important that in securing new automotive equipment the optional items be carefully scrutinized to make sure that those actually required for the job are ordered, and that those not needed are omitted, since each additional item adds to the cost of the unit.

It is desirable to select chassis for use with new truck bodies and their associated equipment, which will last long enough so that the entire unit will be ready for retirement at one time. This saves the considerable cost of transferring equipment from one chassis to another.

In discussing these few currently outstanding items in reference to selection, it is not meant to minimize the other important considerations under the general headings of: Adaptability of Truck to the Work; Reliability; Comparative Economy; and Conformity with Legal Requirements; together with the many details under these headings which will be mentioned

only, as it will readily be seen that a complete discussion of all the items would constitute an extensive article in itself.

Under "Adaptability of Truck to the Work," should properly be considered Performance including such detailed items as Ability, Speed, Brakes, Ease of Handling and Traction.

Then Adaptability also covers Suitability of the Commercial Chassis to take the Equipment which is Special to Telephone Work, e.g. the many kinds of Auxiliary Power Apparatus, Telephone Bodies, Cabs which may be special, and apparatus for Trailer Applications.

Three other features have an important bearing upon Adaptability. They are Adequate Carrying Capacity, Chassis Weight as light as practicable, and Appearance.

Now in connection with "Reliability," the second main consideration mentioned above, there are suggested Quality of Design, Materials and Construction, which affect Freedom from Repair Delays in Telephone Service and thus Continuity of Service to the gangs.

Reliability, of course, involves the character of the Manufacturer's Organization, including the Distributors of the trucks. Factors involved are Stability, extent of Repair and Parts Service facilities, as well as Quality and Promptness of Service.

Under the third main consideration, that of "Comparative Economy," are the following important items from an engineering study viewpoint: Cost of Repairs, Depreciation, Gasoline, Interest on Investment, Lubricants and License Fees.

The fourth and last main consideration, mentioned above, "Conformity with Legal Requirements," focuses attention on such items as Gross Weight, Axle Loads, Tire Sizes, Overall Dimensions, Speed, Brakes and Lights.

Improvements in Truck Cabs

An outstanding feature of recent truck design is the advent of the 5 or 6-man cab on line construction and maintenance

trucks (Figures 9 and 10). The particular cabs illustrated are designated by their manufacturers by the names indicated in the titles. Also, some manufacturers would call the Figure 10 cab a "Cab-Forward" model. However, the "Cab-Over-Engine" designation is often used for either type. Although this large cab can be used on either the conventional or the cab-over-engine design of chassis, experience indicates that the cab-over-engine chassis is much to be preferred due to the fact that its use obviates lengthening the wheelbase by about 3 feet to take a given body. In fact the shortening of the chassis by putting the cab over the engine about cancels the lenthening due to adding an extra seat in the cab.

The 5-man cab is now being studied for possible use in work where it is necessary to move gangs considerable distances between jobs, particularly in cold weather or storms, including severe dust and sand storms. From the viewpoint of handling the truck on the road and on the job, there seems to be no particular advantage or disadvantage to this new equipment.

The power winch on the construction and maintenance trucks using these cabs is as usual mounted just behind the cab. The winch can be seen by the driver, through the large rear cab-window. Since the winch is located somewhat further from him than would be the case with the single seated cabs, it may be found desirable to use automatic rope winders on the winches particularly where there is a considerable amount of cable pulling work to be done.

The cab-over-engine 5-man cab, line construction trucks completely equipped, cost from 10 per cent to 25 per cent more than do similar 3-man cab conventional chassis trucks. This extra first cost together with a slight additional amount for extra maintenance less any possible increase in trade-in value, must, of course, be amortized over the life of the truck in proving in a 5-man cab.

New Type Line Construction and Maintenance Body

It should be mentioned that in the commercial field there is a tendency to increase the widths of the cab-over-engine design of cabs so that there will be sufficient room for the men and also for the engine and controls which ordinarily take some of the cab space. Since the telephone truck bodies are only wide enough for the pole derrick legs and ladders to clear the sides of the narrower conventional cabs, it has been found desirable to develop a new type of line construction and maintenance body (Figures 11 and 12) to provide this necessary clearance for the wider cabs. As yet these new type bodies are available only where required for the wider cab-over-engine cabs.

These trucks handle the same kind of work as the LCW trucks mentioned previously.

Introduction of New Model Chassis

Each year there are changes in the new small car chassis designs of the various manufacturers, and to some extent in the larger ones. In the designing of telephone truck bodies, compartments, ladder brackets, and power equipment every effort is made to so plan the details that the equipment will not only fit all current models of chassis, but that it can be adapted to succeeding models with a minimum of design change.

There is a general trend in the new half ton chassis designs which adds a complication to our body mountings. The rear fenders are becoming more bulbous and longer to the rear so that conventional rear bumpers are so far back that they hold the workmen too far away from the rear body doors for convenient use of the body. In order to meet this situation a new type of special rear bumper is being made available. It will fit all half-ton chassis, clear all types of rear fenders and not interfere with access to the rear of the body.

FIG. 11. NEW TYPE CONSTRUCTION BODY FOR CAB-OVER-ENGINE TRUCK (LEFT SIDE)

FIG. 12. SAME AS FIG. 11 (RIGHT SIDE)

FIG. 13. RELEASING LADDER HOLDER FROM INSIDE CAB

FIG. 14. PUSHING LADDER AWAY SO DOOR CAN BE OPENED AS IN AN EMERGENCY.

FIG. 15. P8T, POLE TRAILER, PNEUMATIC TIRES, 8,000 POUNDS CAPACITY, EXTENSIBLE TONGUE.

FIG. 16. P8T, POLE TRAILER IN SERVICE

Proper Location for Carrying Ladders on Trucks

There has been more or less discussion for many years in regard to the best position for carrying ladders on the trucks with particular reference to the half-ton units. A general check of the Telephone Companies, made some time ago, indicated that the majority favored the usual side mounting. In this connection an important improvement has been made in the line of a new type of holder and improved side brackets which permit the driver to release the ladder while he is in the cab and to open the left side door in case an emergency might make this desirable. (See Figures 13 and 14.)

Trailers, Electric Brakes

Anticipating the growing need for power brakes on some types of trailers, a few years ago studies and some experimental installations were made. Since that time the thousands of Bell System trailers have received careful consideration in order to insure safety in operation and likewise conformance with new state laws which are being enacted more and more generally requiring the use of pneumatic tires and power brakes controlled by the driver of the truck. Eight states now require pneumatic tires on all trailers and 38 states require power brakes upon all except the smallest sizes such as splicers' trailers.

When a decision is necessary in regard to equipping old trailers with pneumatic tires and power brakes, the economics of the situation usually leads to replacement instead of rebuilding, particularly when the old trailers are badly worn or damaged.

Electric trailer brakes are giving very satisfactory service. The new P8T pole trailer (Figures 15 and 16) illustrates the peculiar advantage of electric brakes for Telephone trailers. This unit has a telescoping tongue carrying an electric cable terminated at automatic wiping switches corresponding to each

tongue length. Through this enclosed, protected cable and the automatic switches, is transmitted current controlled from the driver's seat, for operating the brakes, stop lights, tail lights and marker lights.

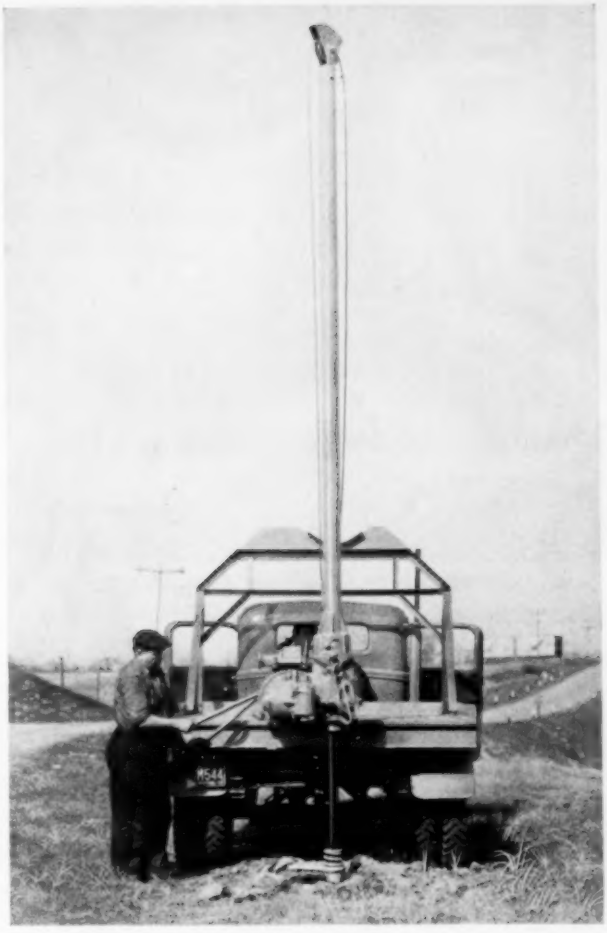
Standard Automotive Equipment in Storm Emergency

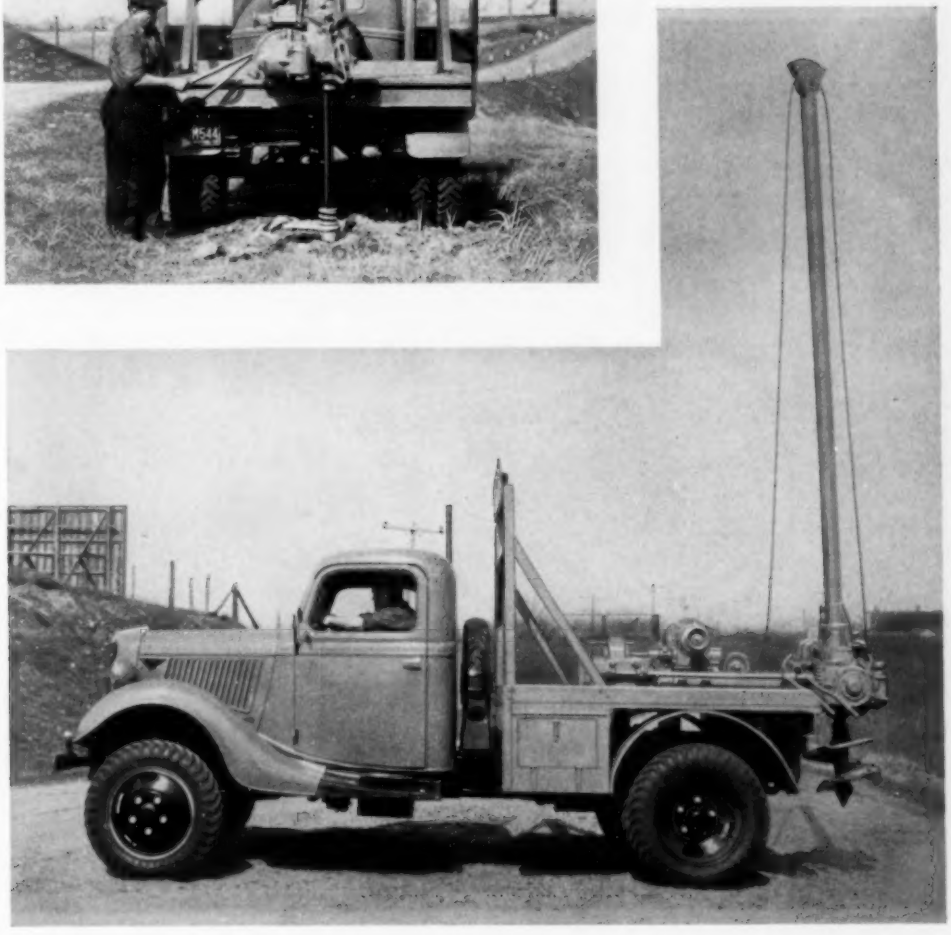
Last fall's storm emergency in New England amply demonstrated the advantages which attach to standardization of automotive equipment. Some 600 motor vehicles were mobilized from far and near and from many different Telephone Companies. Their power winches, power reels, derricks, etc. were of standard designs, so that repair parts, if required, were at hand and could be quickly installed. Standard body designs, familiar to the local supply people, facilitated prompt replenishing of supplies at a time when minutes counted. Throughout the period of restoration, the automotive equipment and construction apparatus gave good accounts of themselves and performed an important part, not only in the great task of restoration, but also in contributing to the excellent safety record which was so significant a feature of this restoral job.

Appearance

In all the motor vehicle planning, appearance is one of the important considerations. Recent improvements in cab design lines have helped. In designing the bodies an attempt is made to give them reasonable proportions and pleasing lines, to the extent that this can be done without sacrificing utility or needlessly increasing cost.

There seems to be no question but that the synthetic enamel finish now used is better adapted for service on the all-metal Telephone trucks and trailers than lacquer finish. It dries with a sufficient gloss without rubbing, holds its original hue and shade very well, chalks off very slowly and requires only infrequent treatment with abrasive polish.





FIGS. 17 AND 18. TYPE D EARTH BORING MACHINE WITH INTEGRAL DERRICK.

FIGS. 19 AND 20. EXPERIMENTAL, VERY LIGHT TYPES OF EARTH BORING MACHINES.

The decalcomania seals and letters for use on motor vehicles are undergoing a redesign with a view to further improving their appearance and also their life. New decalcomania materials are available and will be used for future seals, which will have a very much longer life than the seals now in standard use.

Earth Boring Machines, Pole Derricks, Compressed Air Equipment

Now a few words in regard to the type HC earth boring machines which, with their integral type derricks, are demonstrating their effectiveness in setting poles and placing anchors.

For instance, in less than 3 month's time, two machines were used to set 9,000 poles and place a large number of anchors on the recently built Fourth Transcontinental Line, West of Amarillo, Texas. By their ability to drill even through soft rock they were responsible for a very large saving on this one job, in addition to speeding up the work tremendously.

In another part of the country, 5 of these machines are in service in one company, used for some new line building but principally for replacement work, and it is estimated that the use of boring machines in that company is resulting in a large saving each year. Of course the economies in any case will depend upon the concentration of the pole work to be done and upon the planning of the work.

The HC boring machines are made very strong in order to permit their use under practically all conditions where blasting is not necessary, and as indicated above, where applicable their use results in large savings.

The type D earth boring machine (Figures 17 and 18) is of the same general type as the HC but is much lighter in construction and is carried upon a 1½ ton truck. It will operate in average soils which may even contain some small stones.

Consideration is now being given to some even lighter types of machines driven from the end of the winch shaft, two of which are shown by Figures 19 and 20. Such a light machine,

of course, will drill only under favorable conditions. It is planned through further study to reduce the weight and cost of the small digger to a minimum.

Next, mention should be made of an improved type of derrick equipment for pole handling. The usual derrick for use with a single drum winch is a fixed tripod type. The new LMA derrick now undergoing service trials also requires only a single drum winch but has the advantage that it can be adjusted for operation with various degrees of overhang back of the truck which is advantageous when working under the lower lines and under trees, also for loading pole trailers.

Another unit of power equipment to receive particular attention recently is the air compressor, either operated from a truck power take-off, or from its integral engine on a trailer mounting. The comparatively new air-cooled two-stage compressors have the advantages that by delivering cooler air, they prolong the life of the hose and reduce the temperature of the tool handles.

Plows

The plows for installing buried wire and cable should be mentioned here. From present indications there may be a need for four sizes of plows to cover the different conditions of operation.

In the past two years, considerable amounts of U-type of buried distribution wire have been installed in the Bell System. It has been used principally to connect subscribers in rural areas. The WC plow which is next to the largest of the four plows mentioned above, buries this wire and also the smaller cables, usually in the shoulders of highways. The little 17-T plow buries the wire loops in to the subscribers' premises. (See Figures 21 and 22.) This plow will take draw bar pulls up to 5,000 pounds, and the WC plow up to 15,000 pounds.

Some experimental work is now being done with a type of plow which will be between the WC and the 17-T units. It

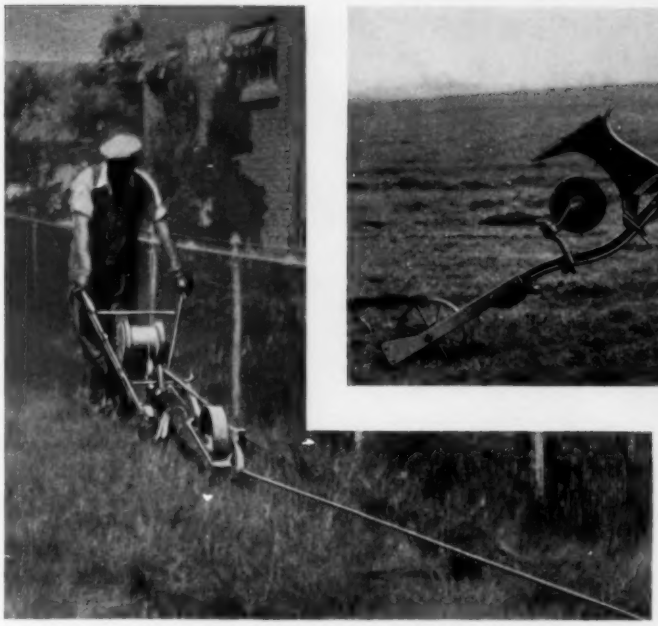
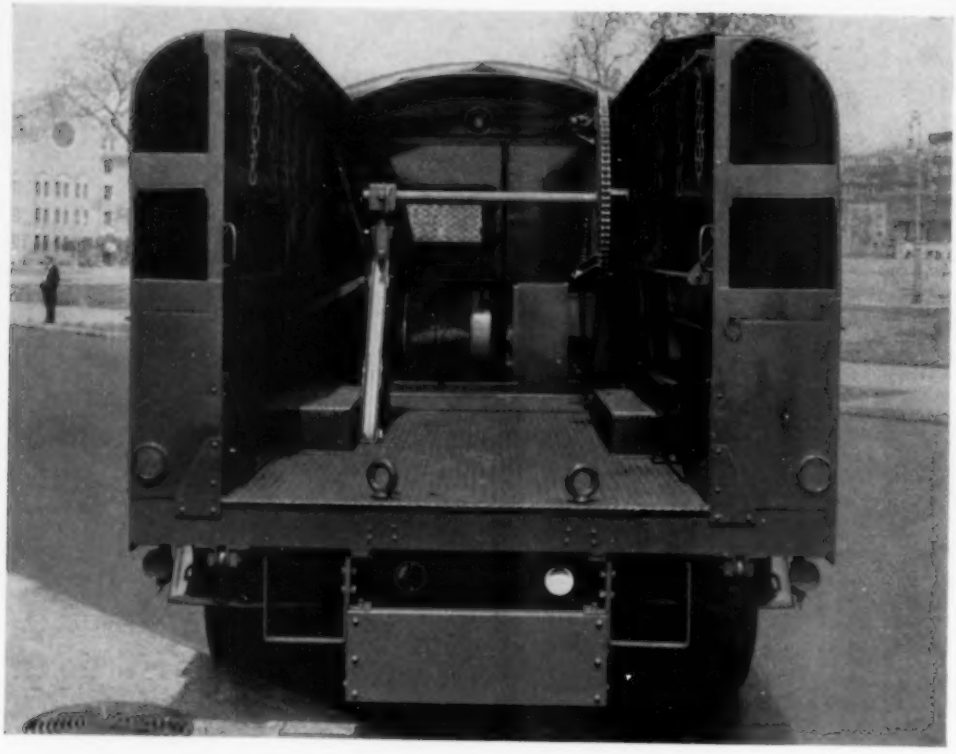


FIG. 21. 17-T PLOW LAYING U DISTRIBUTION WIRE TO A RESIDENCE, PULLED BY A TRUCK WINCH AT THE ROADSIDE.

FIG. 22. MOVING A 17-T PLOW

FIGS. 23 AND 24. C-30 PLOW FOR BURYING CABLE.



FIGS. 25 AND 26. UNDERGROUND CABLE REMOVING APPARATUS.

will be used principally for plowing-in short extensions to existing U Distribution wire lines and will do the same kind of job as the WC unit except that it will not have as many operating features as the WC plow and will be quite inexpensive, so that plows of this type can be located at strategic points in an area, thus permitting the quick connection of a new subscriber requiring only a short run of wire, without waiting for the WC unit to come and do the job. It is planned to pull these plows by using the construction gang trucks, making several cuts at increasing depths, or pulling the plow with the winch line when necessary.

There now seems to be a possibility of considerable work of a heavier nature coming into the picture, such as the 200 mile Stevens Point-Minneapolis coaxial cable job which will be started this summer and of which only a small part will be aerial. To do this work there is need for a heavier cable laying plow than the WC, principally for cross-country use. Plows of this new C-30 type have recently been built (Figures 23 and 24). They will take cables up to 2⅝ inches in diameter, will bury them at any desired depth down to 30 inches and will take a draw-bar pull up to 35,000 pounds. In the C-30 plow are incorporated the features of the WC plow, but the C-30 plow is larger and stronger. The cable opening down through the share is rectangular in cross-section, being 3 inches by 5 inches with the guide plate bent on a varying curve with a minimum radius of 13 inches around which the cable will be fed. A plow of this size is ordinarily pulled by one or more caterpillar tractors.

Two new features which have been incorporated in the C-30 plow will be adaptable to the WC plow. A new type coulter for cutting sod or weeds ahead of the plow-share, has its own skid. The springs actuating the coulter exert a downward thrust of about 300 pounds regardless of position. It has a vertical travel of 17 inches as compared with only 3 inches for the WC coulter. This is very advantageous as it makes a

good slot ahead of the share, even in irregular ground. The other improvement is the substitution of a retractable wheel tongue support for the formerly used skid. This makes the plow easier to handle and is advantageous in passing over disturbed ground where a rooter has been used, to explore a trench for the plow.

The uncertainty that always exists as to underground obstructions makes it necessary to use a shear pin safety link in the pulling line to protect the plow as well as the truck or tractor from serious damage. When the plow hits a very large boulder or any other object, the damage to the equipment may be done before the truck can be stopped unless the pull is released by a safety link, which therefore is used in all cases.

Removing Underground Cable and Taking Down Open Wire

A new type of apparatus for removing underground cable from the ducts or for taking down aerial wire is shown in Figures 25 and 26. Its use is most economical when any considerable amount of either is to be removed. With a view to economically handling work of this nature, a device has been made that consists of several parts including a pair of special hydraulic cable reel jacks built into the truck body and properly braced. One jack carries a large sprocket driven from a smaller one on the winch shaft. This large sprocket is designed to clamp into the side of a standard steel cable reel in such a manner as to drive it. Thus the truck winch drives the detachable steel cable reel and the reel in turn becomes a power winch to pull underground cable out of the ducts directly onto the reel. Likewise aerial wire can be removed and wound onto the reel, several arms at one time.

In cable work up to the present time the reel-winch arrangement ordinarily has been used to remove underground cable which is to be junked, although in some cases cable removed by this method has been reused. Later it is expected that more

suitable sheave, guide arrangements will be made for use in the manhole so that cable to be reused can be more satisfactorily withdrawn from the ducts by this fast method.

With this apparatus, a gang of six men has been able to remove six sections of underground cable per day working in very congested city streets. This was about 100 per cent better than their best performance using former methods. The apparatus adds 850 pounds to the weight of a truck. When not in use the equipment can be left in the truck as it is not much in the way, or the left jack and the spindle can be detached and removed in 10 minutes by two men.

In the preparation of this article it has been necessary, of course, to confine it to a relatively few of the automotive and construction apparatus problems and designs. Those selected are the ones which happen to be of most active interest at present. Sufficient has been said, however, to clearly indicate how vitally important the automotive equipment and construction apparatus have become in the telephone industry and how profitably they may be utilized in its construction and maintenance operations. These operations are carried on more economically and more safely by reason of this equipment. It is playing its part in making possible the prompt installation and repair services which are being given today. Because of it, not only a better, but a cheaper service of supply is possible. In fact, not merely as a means of transportation, but also as a working tool, automotive equipment has become an integral, indispensable part of telephone operations. To maintain this high standard of usefulness, however, requires constant consideration since new problems, new opportunities for economies and new methods of bettering the service are constantly arising.

T. C. SMITH

Important Long Radiotelephone Circuits of the World

FROM time to time since the opening to public use of the first long distance radiotelephone circuit on January 7, 1927, it has been of interest to consider the growth of this type of service. Articles on this subject have appeared in the BELL TELEPHONE QUARTERLY for July 1930 and April 1934. In the September 1937 issue of the Proceedings of the Institute of Radio Engineers, similar information covering a decade of growth in long distance radiotelephony was published.

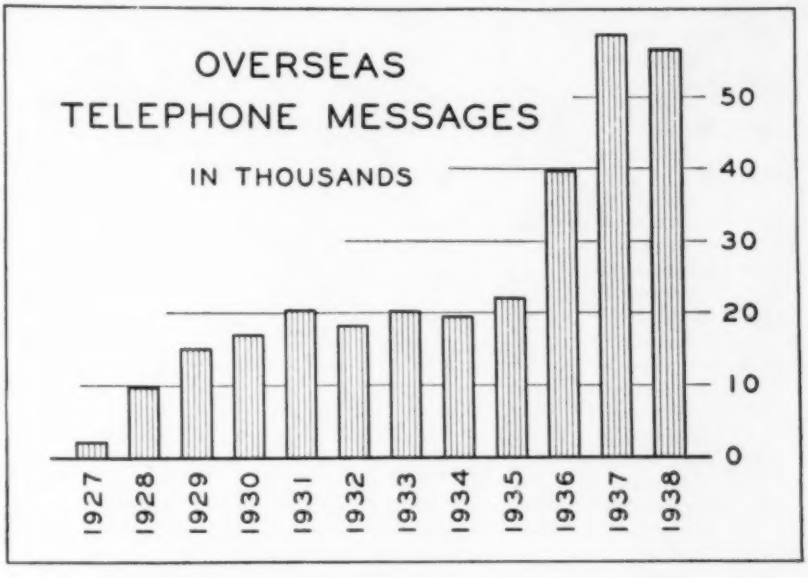
During the last two years alone there have been 42 circuits added to the world network. Of these 32 are for new services and the remaining 10 represent additional circuits added to care for growth. Among the new services are included a number of circuits provided to obtain a more direct route between the points interconnected such as United States to Australia. The more important points reached by radiotelephone for the first time during the last two years included Alaska, China, Haiti, Madeira Island and the Azores.

The world situation as of January 1, 1939, relative to important long radiotelephone circuits is shown graphically in the attached map and accompanying reference list. Through interconnection with these radio circuits it is possible to communicate from any one of the 19,900,000 interconnected telephones in the United States with any one of 16,400,000 telephones overseas. Taken together with the wire and cable connections to Canada, Cuba and Mexico, 72 foreign countries and distant territories and possessions of the United States can now be reached from any Bell System telephone. The interconnected telephones now amount to 93 per cent of all those in the world.

There are three Bell System overseas radiotelephone terminals in the United States—New York, Miami and San Fran-

cisco. New York has direct circuits to London (6 circuits), Paris, Buenos Aires, Lima, Rio de Janeiro and Bermuda. Miami connects directly with 16 points in the West Indies, northern South America and Central America. San Francisco gives service directly to the Orient, to the Philippine and Hawaiian Islands, to Dutch East Indies and to Australia.

The U. S. Army operates a radiotelephone circuit to Alaska from Seattle which is connected at the latter point to Bell System lines. Including this, the direct radiotelephone circuits from the United States reach 26 foreign countries and distant territories and possessions.

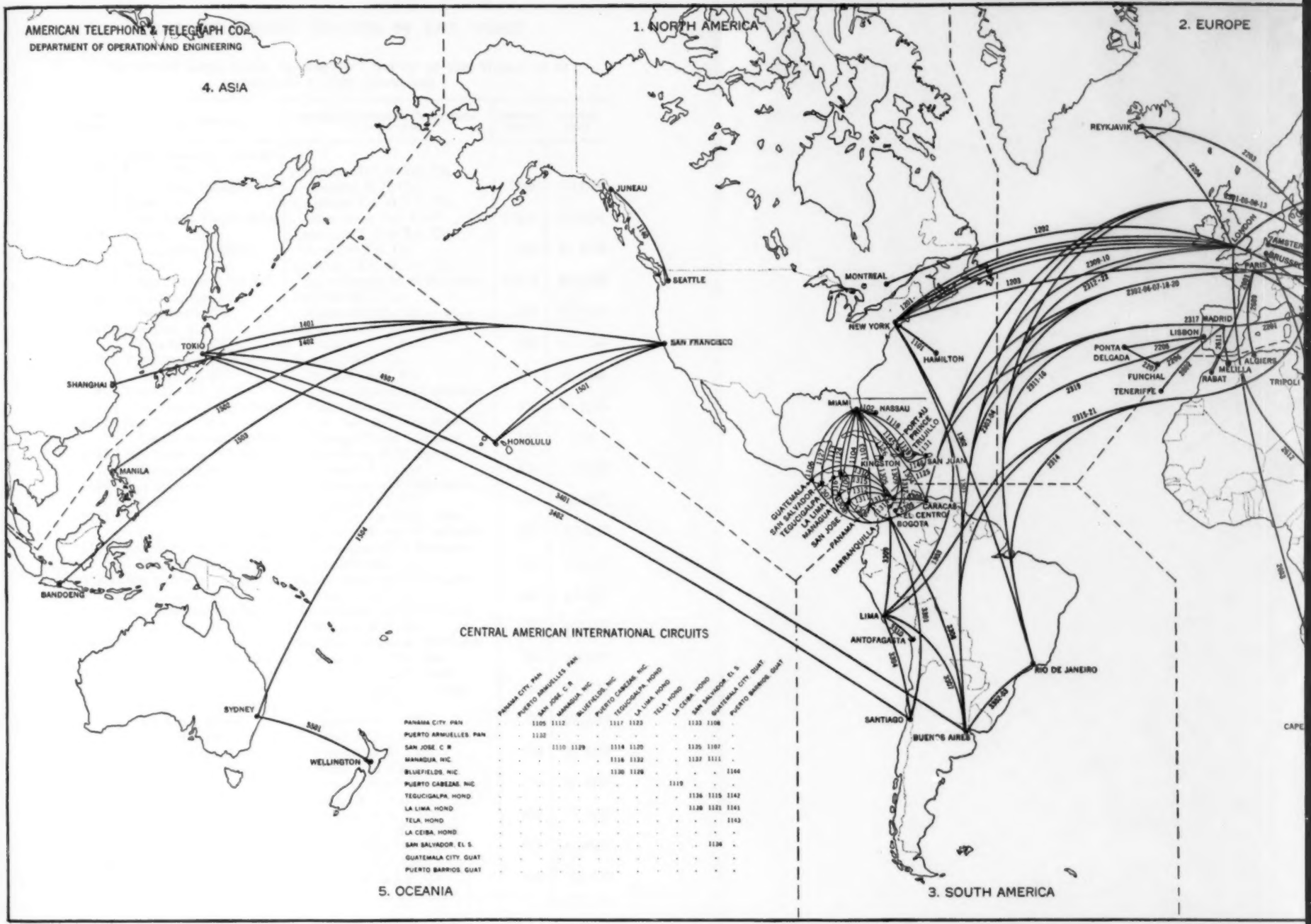


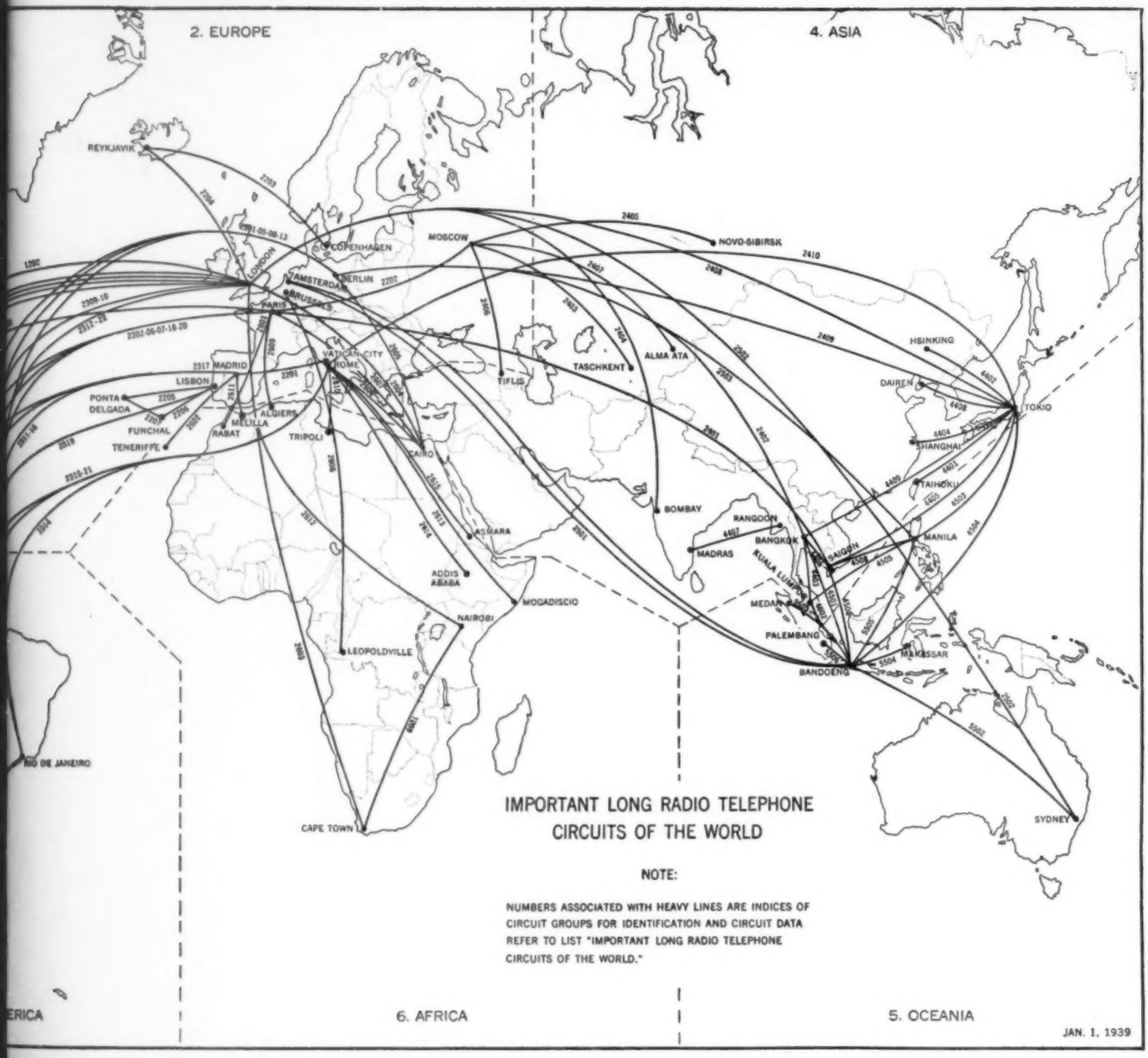
Not only has the service area expanded but there has been a large increase in use of overseas service. This is perhaps best typified by the chart of "Overseas Telephone Messages" to and from the United States as reproduced here from the latest Annual Report of the American Telephone and Telegraph Company.

FRANCIS M. RYAN

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	North America			
1101	New York– Hamilton, Bermuda	American Tel. & Tel. Co. Cable & Wireless (W. I.) Ltd.	800	12/21/31
1102	Miami– Nassau, Bahamas	American Tel. & Tel. Co. Bahamas Government	180	12/16/32
1103	Miami– Panama City, Pan.	American Tel. & Tel. Co. Tropical R.T. Co.	1,160	2/24/33
1104	Miami– San Jose, C.R.	American Tel. & Tel. Co. Co. R. Int. de Costa Rica	1,120	3/20/33
1105	San Jose, C.R.– Panama City, Pan.	Co. R. Int. de Costa Rica Tropical R.T. Co.	320	3/20/33
1106	Miami– Guatemala City, Guat.	American Tel. & Tel. Co. Tropical R.T. Co.	1,020	4/17/33
1107	San Jose, C.R.– Guatemala City, Guat.	Co. R. Int. de Costa Rica Tropical R.T. Co.	550	4/17/33
1108	Guatemala City, Guat.– Panama City, Pan.	Tropical R.T. Co. Tropical R.T. Co.	840	4/17/33
1109	Miami– Managua, Nic.	American Tel. & Tel. Co. Tropical R.T. Co.	1,020	6/ 7/33
1110	San Jose, C.R.– Managua, Nic.	Co. R. Int. de Costa Rica Tropical R.T. Co.	210	6/ 7/33
1111	Guatemala City, Guat.– Managua, Nic.	Tropical R.T. Co. Tropical R.T. Co.	340	6/ 7/33
1112	Managua, Nic.– Panama City, Pan.	Tropical R.T. Co. Tropical R.T. Co.	510	6/ 7/33
1113	Miami, Fla.– Tegucigalpa, Hond.	American Tel. & Tel. Co. Tropical R.T. Co.	930	4/23/35
1114	San Jose, C.R.– Tegucigalpa, Hond.	Co. R. Int. de Costa Rica Tropical R.T. Co.	370	4/23/35
1115	Guatemala City, Guat.– Tegucigalpa, Hond.	Tropical R.T. Co. Tropical R.T. Co.	210	4/23/35
1116	Tegucigalpa, Hond.– Managua, Nic.	Tropical R.T. Co. Tropical R.T. Co.	170	4/23/35
1117	Tegucigalpa, Hond.– Panama City, Pan.	Tropical R.T. Co. Tropical R.T. Co.	640	4/23/35
1118	Miami– Trujillo City, D.R.	American Tel. & Tel. Co. Co. Dominicana de Telefonos	830	10/31/35
1119	La Ceiba, Hond.– Puerto Cabezas, Nic.	Std. Fruit & S.S. Co. Std. Fruit & S.S. Co.	260	10/ /35
1120	San Jose, C.R.– La Lima, Hond.	Co. R. Int. de Costa Rica Tropical R.T. Co.	470	1/15/36
1121	Guatemala City, Guat.– La Lima, Hond.	Tropical R.T. Co. Tropical R.T. Co.	180	1/15/36
1122	La Lima, Hond.– Managua, Nic.	Tropical R.T. Co. Tropical R.T. Co.	260	1/15/36
1123	La Lima, Hond.– Panama City, Pan.	Tropical R.T. Co. Tropical R.T. Co.	730	1/15/36


AMERICAN TELEPHONE & TELEGRAPH CO.
DEPARTMENT OF OPERATION AND ENGINEERING
1. NORTH AMERICA
2. EUROPE
3. SOUTH AMERICA
4. ASIA
5. OCEANIA
JUNEAU
SEATTLE
SAN FRANCISCO
MONTREAL
NEW YORK
HAMILTON
REYKJAVIK
LONDON
PARIS
MADRID
LISBON
PONTA DELGADA
FUNCHAL
TENERIFFE
RABAT
MELILLA
ALGIERS
TRIPOLI
TOKIO
SHANGHAI
HONOLULU
MANILA
BANDOENG
SYDNEY
WELLINGTON
MIAMI
NASSAU
KINGSTON
PORT-AU-PRINCE
TRUJILLO
SAN JUAN
GUATEMALA
SAN SALVADOR
TEGUCIGALPA
LA LIMA
MANAGUA
SAN JOSE
PANAMA
BARRANQUILLA
CARACAS
EL CENTRO
BOGOTA
LIMA
ANTOFAGASTA
SANTIAGO
BUENOS AIRES
RIO DE JANEIRO
CENTRAL AMERICAN INTERNATIONAL CIRCUITS
PANAMA CITY, PAN
PUERTO ARMUELLES, PAN
SAN JOSE, C. R.
MANAGUA, NIC.
BLUEFIELDS, NIC.
PUERTO CABEZAS, NIC.
TEGUCIGALPA, HOND.
LA LIMA, HOND.
TELA, HOND.
LA CEIBA, HOND.
SAN SALVADOR, EL S.
GUATEMALA CITY, GUAT.
PUERTO BARRIOS, GUAT.



IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD

NOTE:

NUMBERS ASSOCIATED WITH HEAVY LINES ARE INDICES OF CIRCUIT GROUPS FOR IDENTIFICATION AND CIRCUIT DATA REFER TO LIST "IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD."

JAN. 1, 1939

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	North America (Cont'd)			
1124	Miami, Fla.– La Lima, Hond.	American Tel. & Tel. Co. Tropical R.T. Co.	860	1/15/36
1125	Miami– San Juan, Puerto Rico	American Tel. & Tel. Co. Porto Rico Tel. Co.*	1,030	2/20/36
1126	Miami– Kingston, Jamaica	American Tel. & Tel. Co. Jamaica Tel. Co.	580	4/ 3/36
1127	Miami– San Salvador, El Sal.	American Tel. & Tel. Co. Government of El Salvador	1,010	6/10/36
1128	La Lima, Hond.– Bluefields, Nic.	Tropical R.T. Co. Tropical R.T. Co.	380	9/ 1/36
1129	San Jose, C.R.– Bluefields, Nic.	Co. R. Int. de Costa Rica Tropical R.T. Co.	150	9/ 1/36
1130	Tegucigalpa, Hond.– Bluefields, Nic.	Tropical R.T. Co. Tropical R.T. Co.	290	9/ 1/36
1131	Trujillo City, D.R.– San Juan, Puerto Rico	Co. Dominicana de Telefonos Porto Rico Tel. Co.*	250	9/ 4/36
1132	San Jose, C.R.– Puerto Armuelles, Pan.	Co. R. Int. de Costa Rica Chiriqui Land Company	140	1936
1133	San Salvador, El Sal.– Panama City, Pan.	Government of El Salvador Tropical R.T. Co.	730	1/14/37
1134	San Salvador, El Sal.– Guatemala City, Guat.	Government of El Salvador Tropical R.T. Co.	110	1/14/37
1135	San Jose, C.R.– San Salvador, El Sal.	Co. R. Int. de Costa Rica Government of El Salvador	440	1/14/37
1136	San Salvador, El Sal.– Tegucigalpa, Hond.	Government of El Salvador Tropical R.T. Co.	120	1/14/37
1137	San Salvador, El Sal.– Managua, Nic.	Government of El Salvador Tropical R.T. Co.	230	1/14/37
1138	San Salvador, El Sal.– La Lima, Hond.	Government of El Salvador Tropical R.T. Co.	150	1/15/37
1139	Trujillo City, D.R.– Port-au-Prince, Haiti	Co. Dominicana de Telefonos West Indies Tel. Co.	150	6/15/37
1140	Seattle– Juneau, Alaska	Signal Corps, U.S. Army Signal Corps, U.S. Army	890	7/ 8/37
1141	Puerto Barrios, Guat.– La Lima, Hond.	Tropical R.T. Co. Tropical R.T. Co.	50	7/ 8/37
1142	Puerto Barrios, Guat.– Tegucigalpa, Hond.	Tropical R.T. Co. Tropical R.T. Co.	130	7/ 8/37
1143	Puerto Barrios, Guat.– Tela, Hond.	Tropical R.T. Co. Tela Railroad Co.	70	7/ 8/37
1144	Puerto Barrios, Guat.– Bluefields, Nic.	Tropical R.T. Co. Tropical R.T. Co.	420	7/ 8/37
1145	Miami– Port-au-Prince, Haiti	American Tel. & Tel. Co. West Indies Tel. Co.	710	9/29/37
1146	San Juan, P.R.– Port-au-Prince, Haiti	Porto Rico Tel. Co.* West Indies Tel. Co.	360	7/23/38

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	North America–Europe			
1201	(1) New York– London (Long Wave)	American Tel. & Tel. Co. British Post Office	3,450	1/ 7/27
	(2) New York– London (see Note 1)	American Tel. & Tel. Co. British Post Office	3,450	6/ 6/28
	(3) New York– London (see Note 1)	American Tel. & Tel. Co. British Post Office	3,450	6/ 1/29
	(4) New York– London	American Tel. & Tel. Co. British Post Office	3,450	10/18/37
1202	Montreal– London	Canadian Marconi Ltd. British Post Office	3,250	7/11/32
1203	New York– Paris	American Tel. & Tel. Co. French P.T.T.	3,610	12/ 1/36
	No. America–So. America			
1301	New York– Buenos Aires	American Tel. & Tel. Co. Co. Int. de Radio*	5,330	4/ 3/30
1302	New York– Rio de Janeiro	American Tel. & Tel. Co. Co. Radio Int. do Brasil*	4,850	12/18/31
1303	New York– Lima, Peru	American Tel. & Tel. Co. Co. Peruana de Tel. Ltd.*	3,680	10/14/32
1304	Miami– Caracas, Ven.	American Tel. & Tel. Co. Co. Ann. Nac. Tel. de Ven.	1,360	12/19/32
1305	Miami– Bogota, Col.	American Tel. & Tel. Co. Co. Telefonica Central	1,510	12/22/32
1306	San Jose, C.R.– Bogota, Col.	Co. R. Int. de Costa Rica Co. Telefonica Central	750	3/20/33
1307	Guatemala City, Guat.– Bogota, Col.	Tropical R.T. Co. Co. Telefonica Central	1,300	4/17/33
1308	Managua, Nic.– Bogota, Col.	Tropical R.T. Co. Co. Telefonica Central	970	6/ 7/33
1309	Miami– Barranquilla	American Tel. & Tel. Co. Co. Telefonica Central	970	11/ 8/34
1310	Guatemala City, Guat.– Barranquilla, Col.	Tropical R.T. Co. Co. Telefonica Central	1,090	11/ 8/34
1311	San Jose, C.R.– Barranquilla, Col.	Co. R. Int. de Costa Rica Co. Telefonica Central	640	11/ 8/34
1312	Managua, Nic.– Barranquilla, Col.	Tropical R.T. Co. Co. Telefonica Central	780	11/ 8/34
1313	Panama City, Pan.– Barranquilla, Col.	Tropical R.T. Co. Co. Telefonica Central	350	12/24/34
1314	Panama City, Pan.– Bogota, Col.	Tropical R.T. Co. Co. Telefonica Central	470	12/24/34
1315	Tegucigalpa, Hond.– Barranquilla, Col.	Tropical R.T. Co. Co. Telefonica Central	880	4/23/35
1316	Tegucigalpa, Hond.– Bogota, Col.	Tropical R.T. Co. Co. Telefonica Central	1,140	4/23/35

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	No. America–So. America (Cont'd)			
1317	Miami– El Centro, Col.	American Tel. & Tel. Co. Co. Telefonica Central	1,330	12/25/36
	North America–Asia			
1401	San Francisco– Tokyo	American Tel. & Tel. Co. Dept. of Com. of Japan	5,130	12/ 8/34
1402	San Francisco– Shanghai	American Tel. & Tel. Co. Dept. of T. & T. of China	6,200	5/19/37
	North America–Oceania			
1501	(1) San Francisco– Honolulu	American Tel. & Tel. Co. Mutual Telephone Co.	2,390	12/23/31
	(2) San Francisco– Honolulu	American Tel. & Tel. Co. Mutual Telephone Co.	2,390	12/20/37
1502	San Francisco– Manila	American Tel. & Tel. Co. Phil. L.D. Telephone Co.	6,970	3/30/33
1503	San Francisco– Bandoeng	American Tel. & Tel. Co. Neth. Indies P.T.T.	9,100	2/ 1/34
1504	San Francisco– Sydney	American Tel. & Tel. Co. Amalgamated Wireless Ltd.	7,430	12/20/38
	Europe			
2201	Madrid– Vatican City	Co. Tel. Nac. de Espana* Vatican City Radio Admin.	820	10/13/34
2202	Moscow– Paris	U.S.S.R. Administration French P.T.T.	1,540	1/21/35
2203	Reykjavik, Iceland– Copenhagen	Icelandic Post & Tel. Admin. Danish Post & Tel. Admin.	1,300	8/ 1/35
2204	Reykjavik, Iceland– London	Icelandic Post & Tel. Admin. British Post Office	1,180	8/ 1/35
2205	Lisbon– Ponta Delgada, Azores	Co. Port. Radio Marconi Co. Port. Radio Marconi	870	9/ 1/37
2206	Lisbon– Funchal, Madeira I.	Co. Port. Radio Marconi Co. Port. Radio Marconi	530	12/10/38
2207	Funchal, Madeira I.– Ponta Delgada, Azores	Co. Port. Radio Marconi Co. Port. Radio Marconi	620	12/31/38
	Europe–South America			
2301	Berlin– Buenos Aires	German Post Office Tel. Int. Nac. Arg. Tr. S.A.	7,410	12/10/28
2302	Paris– Buenos Aires	Companie Generale de T.S.F. Tel. Int. Nac. Arg. Tr. S.A.	6,870	2/ 1/29
2303	Madrid– Buenos Aires	Co. Tel. Nac. de Espana* Compania Int. de Radio*	6,250	10/12/29

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	Europe–South America (Cont'd)			
2304	Madrid– Buenos Aires	Compania Transradio Espanola Tel. Int. Nac. Arg. Tr. S.A.	6,250	1929
2305	Berlin– Rio de Janeiro	German Post Office Companhia R.T. Brasileira	6,230	3/21/30
2306	Paris– Rio de Janeiro	Companie Generale de T.S.F. Companhia R.T. Brasileira	5,700	3/31/30
2307	Paris– Buenos Aires	Companie Generale de T.S.F. Compania Int. de Radio*	6,870	6/11/30
2308	Berlin– Buenos Aires	German Post Office Compania Int. de Radio*	7,410	9/10/30
2309	London– Buenos Aires	British Post Office Compania Int. de Radio*	6,920	12/12/30
2310	London– Buenos Aires	British Post Office Tel. Int. Nac. Arg. Tr. S.A.	6,920	12/12/30
2311	Madrid– Rio de Janeiro	Co. Transradio Espanola Companhia R.T. Brasileira	5,060	1930
2312	London– Rio de Janeiro	British Post Office Companhia R.T. Brasileira	5,770	5/21/31
2313	Berlin– Caracas, Ven.	German Post Office Co. Ann. Nac. Tel. de Ven.	5,240	9/13/31
2314	Rome– Rio de Janeiro	Italo Radio Companhia R.T. Brasileira	5,710	12/ 1/31
2315	Rome– Buenos Aires	Italo Radio Tel. Int. Nac. Arg. Tr. S.A.	6,930	12/ 1/31
2316	Madrid– Rio de Janeiro	Co. Tel. Nac. de Espana* Co. Radio Int. do Brasil*	5,060	1/28/32
2317	Madrid– Caracas, Ven.	Co. Tel. Nac. de Espana* Co. Ann. Nac. Tel. de Ven.	4,350	12/19/32
2318	Paris– Caracas, Ven.	Companie Generale de T.S.F. Co. Ann. Nac. Tel. de Ven.	4,740	7/24/33
2319	Lisbon– Rio de Janeiro	Co. Port. Radio Marconi Companhia R.T. Brasileira	4,180	1/ 6/38
2320	Paris– Rio de Janeiro	Companie Generale de T.S.F. Co. Radio Int. do Brasil*	5,700	6/ 2/38
2321	Rome– Lima, Peru	Italo Radio All Am. Cables & Radio, Inc.*	6,280	9/27/38
2322	London– Rio de Janeiro	British Post Office Co. Radio Int. do Brasil	5,770	4/26/37
	Europe–Asia			
2401	Paris– Saigon, Fr. Indo-China	Companie Generale de T.S.F. Companie Generale de T.S.F.	6,300	4/11/30
2402	Berlin– Bangkok	German Post Office Siamese Government	5,350	4/15/31

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	Europe–Asia (Cont'd)			
2403	Moscow– Taschkent	U.S.S.R. Administration U.S.S.R. Administration	1,720	1931
2404	London– Bombay	British Post Office Indian R.T. Co.	4,470	5/ 1/33
2405	Moscow– Novosibirsk	U.S.S.R. Administration U.S.S.R. Administration	1,740	1934
2406	Moscow– Tiflis	U.S.S.R. Administration U.S.S.R. Administration	1,000	1934
2407	Moscow– Alma Ata, U.S.S.R.	U.S.S.R. Administration U.S.S.R. Administration	1,930	2/ /35
2408	London– Tokyo	British Post Office Dept. of Com. of Japan	5,940	3/13/35
2409	Berlin– Tokyo	German Post Office Dept. of Com. of Japan	5,530	3/13/35
2410	Rome– Tokyo	Italo Radio Dept. of Com. of Japan	6,160	10/ 7/38
	Europe–Oceania			
2501	(1) Amsterdam– Bandoeng (see Note 2)	Netherlands P.T.T. Neth. Indies P.T.T.	7,290	1/ 8/29
	(2) Amsterdam– Bandoeng (see Note 2)	Netherlands P.T.T. Neth. Indies P.T.T.	7,290	12/ 1/29
2502	London– Sydney	British Post Office Australian Post Office	10,560	4/30/30
2503	Berlin– Manila	German Post Office Phil. L.D. Telephone Co.	6,120	3/ 1/33
	Europe–Africa			
2601	Paris– Rabat, Fr. Morocco	French P.T.T. Moroccan T. and T. Admin.	1,140	11/ 3/30
2602	Madrid– Teneriffe, Canary Is.	Co. Tel. Nac. de Espana* Co. Tel. Nac. de Espana*	1,130	1/22/31
2603	London– Capetown	British Post Office Overseas Com. Co. of S.A.	6,010	2/ 1/32
2604	London– Cairo	British Post Office Marconi R.T. of Egypt	2,180	6/22/32
2605	Berlin– Cairo	German Post Office Marconi R.T. of Egypt	1,810	7/22/32
2606	Brussels– Leopoldville, Belg. C.	Belgium Government Belgium Government	3,890	9/15/32
2607	Paris– Cairo	Companie Generale de T.S.F. Marconi R.T. of Egypt	1,990	11/ 1/32
2608	Rome– Cairo	Italo Radio Marconi R.T. of Egypt	1,330	12/20/32
2609	Paris– Algiers	French P.T.T. French P.T.T.	840	6/ 6/33

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	Europe–Africa (Cont'd)			
2610	Rome– Tripoli	Italian Ministry of Comm. Tripoli Administration	390	4/ 1/35
2611	Madrid– Melilla, Span. Morocco	Co. Tel. Nac. de Espana* Co. Tel. Nac. de Espana*	360	12/20/35
2612	London– Nairobi, Kenya	British Post Office Cable and Wireless, Ltd.	4,250	3/ 7/36
2613	Rome– Mogadiscio, It. Somal.	Italian Ministry of Comm. Italian Ministry of Comm.	3,420	4/ 1/37
2614	Rome– Addis Ababa	Italian Ministry of Comm. Italian Administration	2,800	11/ 7/36
2615	Rome– Asmara, Eritrea	Italian Ministry of Comm. Italian Administration	2,380	3/16/37
	South America			
3301	Bogota– Santiago	All Am. Cables & Radio, Inc.* Co. Int. de Radio S.A.*	2,640	8/ 1/31
3302	Buenos Aires– Rio de Janeiro	Compania Int. de Radio* Co. Radio Int. do Brasil*	1,230	12/12/31
3303	Buenos Aires– Rio de Janeiro	Tel. Int. Nac. Arg. Transr. S.A. Companhia R.T. Brasileira	1,230	1931
3304	Lima, Peru– Santiago, Chile	Co. Peruana de Tel. Ltd.* Co. Int. de Radio S.A.*	1,540	12/15/32
3305	Bogota, Col.– Caracas, Ven.	Cia. Telefonico Central Co. Ann. Nac. Tel. de Ven.	650	12/19/33
3306	Barranquilla– Caracas, Ven.	Cia. Telefonico Central Co. Ann. Nac. Tel. de Ven.	530	1/ 1/34
3307	Lima, Peru– Buenos Aires	Co. Peruana de Tel. Ltd.* Compania Int. de Radio*	1,950	12/ 1/34
3308	Bogota, Col.– Buenos Aires	All Am. Cables & Radio, Inc.* Compania Int. de Radio*	2,900	12/10/34
3309	Lima, Peru– Bogota, Col.	Co. Peruana de Tel. Ltd.* All Am. Cables & Radio, Inc.*	1,170	2/22/35
3310	Lima, Peru– Antofagasta, Chile	Co. Peruana de Tel. Ltd.* Co. de Telefonos de Chile*	1,000	6/16/36
	South America–Asia			
3401	Buenos Aires– Tokyo	Tel. Int. Nac. Arg. Transr. S.A. Dept. of Com. of Japan	11,500	4/10/37
3402	Santiago, Chile– Tokyo	Compania Int. de Radio* Dept. of Com. of Japan	10,740	6/21/38
	Asia			
4401	Tokyo– Taihoku, Formosa	Dept. of Com. of Japan Dept. of Com. of Japan	1,340	6/20/34
4402	Tokyo– Hsinking, Manchukuo	Dept. of Com. of Japan Manchuria T. and T. Co.	970	8/ 1/34

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	Asia (Cont'd)			
4403	Kuala Lumpur, F. M. S.–Bangkok	Dept. of Posts, F. M. S. Siamese Government	1,020	9/ 2/35
4404	Tokyo–Shanghai	Dept. of Com. of Japan Dept. of T. & T. of China	1,100	2/15/36
4405	Tokyo–Saigon, Fr. Indo China	Dept. of Com. of Japan Companie Generale de T.S.F.	2,680	5/ 1/36
4406	Saigon, Fr. Indo China–Bangkok	Companie Generale de T.S.F. Siamese Government	460	5/ 4/36
4407	Madras, India–Rangoon, Burma	Indian R.T. Co. Burmese Government	1,100	12/24/36
4408	Tokyo–Dairen, Kwantung	Dept. of Com. of Japan Manchukuo T. and T. Co.	1,000	3/ 5/37
4409	Tokyo–Bangkok	Dept. of Com. of Japan Siamese Government	2,850	3/11/37
	Asia–Oceania			
4501	Bandoeng, Java–Bangkok	Neth. Indies P.T.T. Siamese Government	1,470	4/15/31
4502	Bandoeng, Java–Kuala Lump., F. M. S.	Neth. Indies P.T.T. Dept. of Posts, F. M. S.	720	3/19/34
4503	Tokyo–Manila	Dept. of Com. of Japan Phil. L.D. Telephone Co.	1,870	9/26/34
4504	Bandoeng, Java–Tokyo	Neth. P.T.T. Dept. of Com. of Japan	3,610	10/26/34
4505	Manila–Kuala Lump., F. M. S.	Phil. L.D. Tel. Co. Dept. of Posts, F. M. S.	1,580	11/27/34
4506	Bandoeng, Java–Saigon, Fr. Indo China	Neth. Indies P.T.T. Companie Generale de T.S.F.	1,200	10/19/36
4507	Tokyo–Honolulu	Dept. of Com. of Japan Mutual Telephone Co.	3,850	3/25/38
4508	Saigon, Fr. Indo China–Manila, P.I.	Companie Generale de T.S.F. Phil. L.D. Telephone Co.	1,130	11/ 3/38
	Oceania			
5501	Sydney–Wellington, N. Z.	Australian Post Office New Zealand Government	1,370	11/25/30
5502	Bandoeng, Java–Sydney	Neth. Indies P.T.T. Australian Post Office	3,390	12/23/30
5503	Bandoeng, Java–Medan, Sumatra	Neth. Indies P.T.T. Neth. Indies P.T.T.	880	9/16/31
5504	Bandoeng, Java–Makassar, Celebes	Neth. Indies P.T.T. Neth. Indies P.T.T.	850	7/ 1/33
5505	Bandoeng, Java–Manila	Neth. Indies P.T.T. Phil. L.D. Telephone Co.	1,740	2/23/33

IMPORTANT LONG RADIO TELEPHONE CIRCUITS OF THE WORLD AS OF JANUARY 1, 1939 (*Continued*)

Circuit Group	Circuit Terminals	Operating Company, Government or Department	Statute Miles	Service Date
	Oceania (Cont'd)			
5506	Bandoeng, Java– Palembang, Sumatra	Neth. Indies P.T.T. Neth. Indies P.T.T.	300	1/ 4/37
	Africa			
6601	Cape Town– Nairobi, Kenya	Overseas Com. Co. of S.A. Cable and Wireless, Ltd.	2,490	4/ 1/38

* Indicates International Tel. and Tel. Co. subsidiary or affiliate.

Note 1: Circuits noted in Group 1201 are arranged (1938) for "twin channel" operation, thus each affords two message circuits. The New York–London group therefore comprises a total of 6 circuits when twin channel operation is used.

Note 2: Circuits in Group 2501 are arranged (1938) so that each affords four telephone message circuits, making a total of eight circuits between Amsterdam and Bandoeng when multi-channel operation is used.

Notes on Recent Occurrences

SPECIAL PLAQUE HONORS BELL SYSTEM EMPLOYEES FOR HURRICANE WORK; TWO SILVER VAIL MEDALS AWARDED

A SPECIAL plaque honoring Bell System employees for their loyalty, devotion to duty, and achievement during and after the hurricane of last September, and two silver Vail Medals to individual employees, have been awarded by the National Committee of Award of the Theodore N. Vail Medals for the year 1938.

The report of the Committee in awarding the special plaque is as follows:

The National Committee desires to recognize especially the splendid performance of employees of the Bell System who contributed to the maintenance and restoration of service during and following the September 21, 1938 hurricane in the Northern Atlantic States. This was the worst catastrophe ever to strike that area. In a brief few hours it took 682 lives and destroyed more than $500,000,000 worth of property. The Bell System suffered the greatest damage to outside plant and the largest number of service interruptions in its history. Approximately 600,000 telephones were silenced and telephone damage amounted to about $10,000,000. Confronted with this unparalleled test, the organized resources of the Bell System were promptly mobilized to meet the emergency. Standardized materials for the vast job of reconstruction were immediately available and trained employees from various parts of the Bell System quickly responded to the needs of the emergency by supplementing the efforts of their fellow-employees in the stricken area. Through their combined and untiring efforts, crippled plant was soon restored to service, emergency

circuits were installed for public and relief purposes, and restoration was accomplished with skill, ingenuity, team-work, unity of purpose and courage.

In this tremendous accomplishment, it has not been possible to single out employees for individual awards. It was, rather, a System-wide coöperative effort on the part of all. The National Committee believes that this self-sacrificing devotion to duty under most trying and difficult conditions conspicuously illustrates the high ideals which govern the Bell System policy as to telephone service and has awarded a special bronze plaque bearing the following inscription:

AWARDED TO
EMPLOYEES OF THE
BELL SYSTEM
BY THE NATIONAL COMMITTEE OF AWARD
THEODORE N. VAIL MEMORIAL FUND
IN RECOGNITION OF
LOYALTY, DEVOTION TO DUTY AND ACHIEVEMENT

THE HURRICANE OF SEPTEMBER, 1938

THEIR MERITORIOUS ACTS CONSPICUOUSLY EXEMPLIFY
THE HIGH IDEALS AND TRADITIONS OF PUBLIC SERVICE

Silver Vail Medals, with accompanying payments of $250, were awarded to Jerry Frank Kincannon, Exchange Repairman, Southwestern Bell Telephone Company, Miami, Oklahoma, and George F. Wilson, Installer Repairman, The Pacific Telephone and Telegraph Co., Grass Valley, California.

RADIO TELEPHONE SERVICE OPENED TO SINGAPORE

SINGAPORE came within reach of Bell and Bell-connecting telephones on June 1, when radio telephone service was extended to Malaya. The new service is provided by means

of two short wave radio circuits—one 9,100 mile channel between San Francisco and Bandoeng in Java, over which service is maintained with the Netherlands Indies, and another, 720 miles long, which reaches from Bandoeng to Kuala Lumpur in the Federated Malay States. Wire lines extend from Kuala Lumpur to the Straits Settlement, of which Singapore is the capital, and to most of the Malay Peninsula.

DR. JEWETT ELECTED PRESIDENT OF NATIONAL ACADEMY OF SCIENCES

BY HIS recent election to the Presidency of the National Academy of Sciences, Dr. Frank B. Jewett, Vice President of the American Telephone and Telegraph Company and President of the Bell Telephone Laboratories, has received one of the highest honors that can be given to an American scientist. The Academy is the national organization of senior scientists distinguished for their research contributions—the American counterpart of the Royal Society. Membership is limited to 350; at present there are 304 names on the roster. Dr. Jewett's term of office is for four years and begins July 1st, 1939.

LABORATORIES MEN ARE HONORED BY FRANKLIN INSTITUTE

JOHN R. CARSON and George A. Campbell were presented with Elliott Cresson Medals by the Franklin Institute of Philadelphia at the annual Medal Day exercises held on May 17. Dr. Carson, a member of the Research Department of Bell Telephone Laboratories, was awarded his medal "in consideration of outstanding contributions to the art of electrical communication." Dr. Campbell, who retired from active service in 1935, received his "in consideration of his life-long study of the theory of electric circuits, resulting in notable

contributions to the science that underlies telephony and to inventions of fundamental importance in the art."

These medals were founded in 1848 by Elliott Cresson, of Philadelphia, who conveyed to the Trustees of the Institute a sum of money for the purpose. In general the awards are made "for some discovery in the arts and sciences, or for the invention or improvement of some useful machine, or for some new process or combination of materials in manufacture, or for ingenuity, skill or perfection in workmanship."

DEGREE OF DOCTOR OF CIVIL LAW CONFERRED UPON WALTER S. GIFFORD

THE honorary degree of Doctor of Civil Law was conferred upon President Walter S. Gifford, of the American Telephone and Telegraph Company, by Union College, Schenectady, New York, on June 12, 1939. Mr. Gifford was made Honorary Chancellor for 1939–40 and delivered the Commencement address to the graduating class, his subject being "Business—Today's Foremost Profession."

DEGREE OF DOCTOR OF SCIENCE CONFERRED UPON CHARLES P. COOPER

ON June 12, 1939, the honorary degree of Doctor of Science was conferred upon Charles P. Cooper, Vice President of the American Telephone and Telegraph Company, by Ohio State University. Mr. Cooper graduated from Ohio State University in 1907.

DEGREE OF DOCTOR OF LAWS CONFERRED UPON WILLIAM H. HARRISON

ON JUNE 4, 1939, William H. Harrison, Vice President and Chief Engineer of the American Telephone and Telegraph Company, received the degree of Doctor of Laws from

The University of Notre Dame, Notre Dame, Indiana. In discussing Engineering in his Commencement Address, Mr. Harrison said, in part:

"Like all successful social movements, engineering embraces the origin, cultivation and integration of powerful forces.

"To explore its beginning, to analyze its growth, to depict its practices, and to symbolize its meaning at length would hardly be in keeping with the present occasion. But I do want to try to establish the claim it has to a favored position among the professions.

"Surrounded by a morass of selfishness, civilization has ever struggled toward simple human objectives. In primitive society instincts of self-preservation and of satisfying physical needs were the sole motives for action. With the development of civilized society, however, the need for order and protection, health, and the satisfactions of spiritual and intellectual living have created the professions of law, medicine, teaching, and theology, dedicated to the use of learning in the service of man. But throughout all history, without record of beginning, there have existed three other powerful forces built around human needs: first, the urge to create; second, the desire to lift the burden of work; and third, the impulse to spread the results of creative effort to the benefit of mankind. It is these forces that constitute the origin and birth of the artisan, the engineer, and the economist.

"Much is recorded of the work of engineers and of their influence on social progress. Turning rapidly the pages of history from the Stone Age to Medieval Europe, there come to mind the tower of Babel, the Pyramids, the Parthenon, and the roads, bridges, and aqueducts of the Roman Empire. These suggest to the imagination the important influence of engineering on such ancient cultures as those of Babylonia, Egypt, Greece, and Rome.

"More subtle and deep in its influence is the rising of such personalities as Thales, Pythagoras, Euclid, Archimedes, Hip-

parchus and others, who sought, in the depths of nature's secrets, an understanding and systematized use of physical knowledge. They are not perhaps the most popularly known figures of their times, but their constructive and fundamental thinking was of more permanent importance to the world than the meteoric careers of men like Alexander, Hannibal, and Cæsar, who, in contrast, by ably organizing the resources available to them, developed to a high point the art of acquiring power and wealth, for the most part by taking them away from others.

"Probably the first consciousness of the power of engineering and, consequently, the first professional unity among engineers, arose out of military activity. In English history the word 'engineering' was first applied 'to the operations of those who constructed engines of war and executed works intended to serve military purposes.' 'The Domesday survey of A.D. 1086 includes one "Waldivus Ingeniator" who . . . was probably William the Conqueror's Chief Engineer.'

"Identification or recognition of those so engaged as military engineers, as we think of them to-day, is exemplified in the organization of the 'Corps de Génie' founded in 1690 by Vauban, a French engineer renowned for his skill in designing fortresses and methods of attack. Another such corps, rich in tradition, is the 'Royal Engineers' of England formed about a half century later.

"While engineers at first were military men, spectacular results of the union of civil and military projects are seen in the Roman highways and aqueducts. But the direction of widespread engineering effort to purely civil affairs, so as to contribute to the economic welfare and protection of people in social and political groups, rather than to their destruction, does not become evident until the beginning of the Seventeenth Century.

"Then came a 200-year period of great significance. In the tumult of the Renaissance and Reformation, the religious and

political wars, the changing political and social life in Europe, and the migration of oppressed groups to America, the march of man's intellect into the unknown took form. For in this period is found the advent of modern scientific knowledge, coming largely from the study of astronomy, mathematics, mechanics and chemistry, and, to name but a few, exemplified by the life work of such men as Galileo, Kepler, Descartes, Newton, Pascal, vonGuericke, Dalton, Cavendish, Gauss, Coulomb, and Galvani.

"For the first time in history, progress held in its crucible the structural and practical arts of the past centuries, the newly discovered facts of science, the techniques of mathematics in their formative stage, and the beginnings of industrial organization. The direction of all these forces toward the upbuilding of man crystallized into a professional activity and led to the formation of definite professional groups. Among the first was the Institution of Civil Engineers established in England in 1818. In its charter engineering was defined in words which show its origin and its scope at that time:

> Art of directing the great sources of power in nature for the use and convenience of man . . . as applied in the construction of roads, bridges, ports, moles, lighthouses. . . .

"With these influences at work it was almost inevitable that the first half of the Nineteenth Century should witness those great engineering developments which placed practically unlimited power at the disposal of mankind, and thus opened the door to building the world of to-day.

"Here in America, in a new nation unhampered by class distinctions, and relatively free religiously, politically and industrially to work out its destiny, these forces found boundless opportunities. With the developments in manufacture and industry came industrialization and urbanization. Power was needed, rail transportation had only begun, and modern communications and power transmission were unknown. From

1820 to 1870 the proportion of our population engaged in industry, and the professions, increased three-fold.

"This same period saw education in Europe reaching into the scientific field, as shown by the organization of the technical schools of Germany, the scientific or polytechnic schools of France, and the universities and the 'Guild' or mechanics institutes of England.

"As one would expect, the history of technical education in this country paralleled that of industrial development. Colored by the importance of spiritual and linguistic instruction, education at first was almost entirely non-technical in character, although elementary science was soon introduced. Exceptions to the general rule are the Military Academy, its formation a necessity following the Revolution; Rensselaer, a civil engineering institution established coincidently with the British Institution of Civil Engineers, and the Mechanics Institutes, an outgrowth of the consideration by the guilds for the advancement of the sons of mechanics.

"But until about the middle of the century there were only five of our present engineering schools in existence. The passage of the Morell Act in 1862, establishing Land Grant colleges of mechanical arts, greatly stimulated this development. In the decade following, the number of engineering schools increased to 70, nearly half the present number. It is noteworthy that engineering was introduced at Notre Dame as early as 1873. To-day approximately 10 per cent of the male college students in America are studying engineering, and many others, of course, are specializing in science.

"This most casual reference to history makes it clear that engineering is a tremendous social force, and a most important influence in the development of modern civilization. Although much of the spectacular may be attributed to it, its nature and origin are wedded to the common work of the world and to the toil of men in business and in industry. It is difficult to characterize engineering as conforming to any pattern of edu-

cational philosophy unless it be that process by which knowledge and wisdom are transformed so as to enhance the skills of life.

"So much for the past; what of the future?

Experience shows beyond all doubt that the destiny of people bound together by ties of common knowledge and proper codes of action can best be served by united effort. All the professions bear witness to this truth. But whatever real value such groups may have is shown by their social effect —by their contributions to the well-being of mankind—and by these things alone.

"History will doubtless look back upon the present as a period of turmoil and distress, of readjustment and reorganization. In these times of confusion, with the sense of inadequacy, fear, and intolerance which goes with it, there is a great premium on the use of reason devoid of all prejudice. The future of mankind, as I see it, therefore, depends on the ability of discerning minds, capable of clear and logical thinking, to create out of the present confusion a constructive course of conduct which will bring reassurance to the disturbed and disillusioned.

"It is fair to ask whether engineering in the professional and collective scope of its activity can contribute to this end. There is good reason to believe that it can. There is power in the collective and individual character of professionally minded engineers. For the most part their reasoning is intellectually honest, tempered by controlled experience and inquiry, the fruits of which are knowledge and the subtle and immeasurable power of discrimination. Knowledge and the power of discrimination will never cease to be of inestimable and lasting value to mankind. Then too, the application of a constantly expanding knowledge of the physical world to man's needs opens a vista of continued and broadened service.

"Helping in the social adjustment of man to his rapidly changing environment is a challenge, as well as a responsibility

and a privilege, to every well-balanced engineer, and I am confident that the challenge will be met.

"In saying that I am mindful that to-day, as in the past, there are some who question the value of both science and engineering and attribute to them unemployment, and other causes of present day social disorder. One writer characterizes this point of view 'as the spirit of materialism which has conditioned modern men to accept a compromise with decency.'

"It is not without significance that history reveals these as the fruits of prosperity and selfishness long before civilizations were conscious of mechanization. The fact that the moral and spiritual backbone of society has never been stiffened to resist the temptations of prosperity cannot reasonably be ascribed to physical sciences.

"After all is said and done, however, idealism, which deals with remote consequences, must be tempered by the realism of the immediate, and I want to talk with you briefly about the road ahead.

"I know you will forgive me if I first tell you how much I cherish the honor that is mine to-day. I am grateful beyond expression, and with it all, am very humble, for despite the generous words you heard to-day, I know full well that I am here simply because of circumstances of opportunity, opportunity present only in free enterprise, and you need no reminder that free enterprise finds expression nowhere except in a true democracy.

"Looking back over the road of opportunity I have traveled and viewing the experience in the light of tomorrow, I wonder about the road over which your generation is to travel. I wonder the more because you who stand on the threshold of business careers will shape the future of my generation as well as your own.

"Those of us whose life work has been in the industrial field have seen technical and theoretical genius so effectively com-

bined with capacity for adaptation and application, in an era of free enterprise, as to give a civilization which the boldest of men could not have visualized even as late as the turn of the century. There is mechanical power beyond comprehension; overnight transcontinental transportation; the automobile; world-wide instantaneous transmission of human voice; radio broadcasts to unseen millions; and, literally, the things that make for our daily bread, from the seven seas, from the five continents, are ours as a matter of course.

"Throughout this period there has been abundant opportunity for men and women in almost every line of endeavor. Industry, enterprise, individual effort, initiative, could not be denied. It has been truly a time where the rewards of yesterday nourished the aspirations of tomorrow.

"Perhaps it is this over-abundance of aspirations and opportunities that brought us some of the present day ills which cloud and make uncertain the outlook ahead, which lead many thoughtful people in their unimaginative moments to question whether there are any more frontiers left to explore, lead them to doubt whether individual enterprise has not become so restricted, and so limited, as to discourage the search for better things.

"Such a view is as old as the pages of history; and it is as fallacious now as it is proved to have been fallacious in the past.

"The advance of human intellect cannot be suppressed. The pioneering spirit of free men will not die. And, most important of all, the wants of mankind cannot be denied. Human nature with its perfections and imperfections remains the same. Hope, ambition, aspiration remain the most cherished traditions of our American heritage.

"So long as this is so, the future of the coming generations will be abundant in opportunity, and I hold firm to the belief that free enterprise will continue for all. No generation is ever without periods of disillusionment, and much of the road

ahead is uncharted. But in my mind, as your road of tomorrow takes form, there is an ample range of opportunity for those who are willing, eager, and understanding."

(NOTE: For helpful suggestions in the preparation of this address acknowledgment is made to Mr. O. W. Eshbach, of the American Telephone and Telegraph Company, who on July 1, 1939, became Dean of Engineering of the Northwestern Technological Institute.)